MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for October, 1904, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 167; West Indian Service, cable and mail, 4; River and Flood Service, regular 43, special river and rainfall, 190, special rainfall only, 56; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3025; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. R. C. Lydecker, Territorial Meteorologist, Honolulu, Hawaii; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. ALFRED J. HENRY, temporarily in charge of Forecast Division.

The weather over the North Atlantic during the first decade of the month was not characterized by gales of unusual character for the season, although a marked barometric depression, that was central on the 1st over the Canadian Maritime Provinces, moved slowly eastward over the Atlantic on the 2d. During the second decade of the month the disturbances which passed over the Atlantic from the North American Continent were generally without marked energy. Fresh westerly gales prevailed over the northern portion of the British Isles and to the westward over the Atlantic on the 16th and 17th, and again on the 20th and 21st. During the last decade of the month a tropical disturbance moved rapidly northeastward from the Carolina coast, where it was central on the evening of the 20th, and disappeared east of the Canadian Maritime Provinces on the 23d. Unsettled weather, with occasional moderate gales, prevailed as far south as the Azores on the 25th and 26th. The observatory at Horta reported a maximum wind velocity of 60 miles an hour from the northeast on the morning of the 26th. A disturbance evidently moved east-southeast from the Azores to the coast of Spain during the 27th, 28th, and 29th. The month closed with the advance of an area of high pressure from the American Continent, although fresh north to west gales prevailed in the vicinity of Bermuda on the morning of the 31st.

In the United States the barometric disturbances of the month were confined mostly to the northern portion of the country. With one or two exceptions, they possessed no features worthy of mention. A shallow disturbance was noted over the Caribbean Sea as early as the 10th. It moved slowly west-northwest during the 11th and 12th, and by the morning of the 13th its northward advance was made apparent by moderate easterly winds attended by rain on the southeast Florida coast. At no time during the 10th, 11th, and 12th was the center of the disturbance near enough to any observation station to enable the officials of the Bureau to determine its intensity and probable direction. High winds set in over southern Florida on the 14th, continuing during the 15th, and attaining hurricane force on the evening of the 16th, at which time telegraphic communication with the southeast Florida coast was interrupted. On the morning of the 17th the wind at Jupiter, Fla., was blowing from the eastward with a velocity of 60 miles an hour. It increased during the day to 68 miles, and diminished rapidly during the evening. The center of the storm apparently remained stationary over southern Florida from the morning of the 17th until the morning of the 19th. It diminished greatly in energy, and during the 19th only moderate winds were experienced, except at Jacksonville, where a northeast wind of 32 miles an hour was recorded. During the night of the 20th a fresh center appears to have developed a short distance off the South Carolina coast. This new center moved rapidly north-northeast, passing Wilmington, N. C., about 3 a. m. of the 21st and Philadelphia, Pa., about 9 a. m., and disappearing over the Canadian Maritime Provinces on the evening of the 21st. In its northward course it was

attended by heavy rains in the Carolinas, Virginia, Maryland, eastern Pennsylvania, eastern New York, and New England.

The most serious accident to shipping was the foundering of the 3-masted British schooner *Melrose* off the Florida coast Saturday morning, October 15. Seven lives were lost and the survivors were without food and water nearly four days. A press dispatch from Miami, Fla., under date of October 19, gives the following additional information:

After blowing a gale Saturday and Sunday, the storm predicted for south Florida broke over this place Sunday night about nightfall. In a few hours Miami and most of the towns on the east coast of Florida were cut off from communication with the outside world. Telegraph wires were blown down and the railroad tracks were obstructed, and not until to-day was communication restored. The wind attained a maximum velocity of 75 miles per hour here. The chief damage here on land was done by the rain. A few roofs were damaged and window panes blown in, so that the buildings were damaged by rain.

In the surrounding country the fruit and vegetable crops were damaged to a considerable extent.

The 4-masted schooner *James Judge*, of Philadelphia, is aground four miles south of Palm Beach, having gone ashore Monday in a terrific gale, in which the wind was blowing 60 to 90 miles an hour. The crew are all safe. The vessel is badly damaged. It carried no cargo.

The 3-masted bark *Zion*, owned by A. Hemmes, of Emden, Germany, loaded with a million feet of lumber, from Pensacola to London, stranded five miles north of the House of Refuge, near Fort Lauderdale, about 3 o'clock yesterday and Captain Hemmes and crew of fourteen men, after several hours of struggling, saved themselves with the aid of pieces of lumber and improvised rafts.

Ample and continued warnings of the approach of this storm were widely distributed along the south Atlantic and Gulf coasts. The following clipping from the Daily Metropolis, Jacksonville, Fla., dated November 5, 1904, testifies as to the efficient manner in which these warnings were distributed:

The recent tropical storm that swept the southeast portion of this State during the middle of October did not reach that section without due warning from the Weather Bureau, given five or six days before the storm approached the coast of Florida. The first notice from the Weather Bureau that a tropical disturbance was developing south of Jamaica was given out by the Central Office at Washington on the 11th of October, and nearly a week followed before the storm reached the coast near Miami. With this timely warning, it is sad, indeed, that loss of life should have resulted from the failure of the master of a vessel to heed the notice of the Weather Bureau that "caution was advised." We refer to the master of the schooner *Melrose*, bound from Jacksonville for the Bahamas, whose attention was called to the predicted storm. The master replied that he thought he could make the trip, and proceeded southward, running into, or near, the storm center. A wrecked vessel and the loss of five or six lives is the penalty he paid for ignoring the information issued by the Weather Bureau. It is painful to allude to such misfortunes, but it is, nevertheless, profitable to others, so that in the future such recklessness may be avoided. During the period of tropical storms sailing vessels should use every precaution. The Weather Bureau bases its warnings on scientific deductions, and generally with great accuracy, and it is criminal in any master to ignore them during the period of hurricanes. It is a case of everything to lose and nothing to gain.

The month was unusually dry. With the exception of the heavy rains that fell along the Atlantic coast, especially over southern Florida, during the prevalence of the stormy conditions attending the tropical disturbances of the 14th–19th, and 20th–21st, no rains of consequence fell in eastern and southern districts. The drought was especially severe in the east Gulf States, where no rain of importance has fallen since the early part of September.

NEW ENGLAND FORECAST DISTRICT.

A severe and general storm prevailed over the district on the 21st. It caused heavy winds and gales in all sections, with general rains ranging from moderate to excessive amounts. The gales along the coast greatly delayed and inconvenienced shipping and caused more or less damage, although so far as reported without loss of life. The storm resulted in much damage to telegraph and telephone wires throughout the cities and towns of New England, thereby delaying and preventing the transaction of business. In a number of instances plate glass windows and large signs were destroyed and fruit and shade trees damaged or blown down. At Auburndale, Mass., a man was killed by the falling of a live wire, and at Worcester a boy was killed by a heavy gate. As the crops had been generally secured, the agricultural interests suffered little damage. Excepting the above-mentioned storm, the weather of the month was very pleasant and is generally classed by the voluntary observers and correspondents as "fair and cool."—*J. W. Smith, District Forecaster.*

NORTH-CENTRAL FORECAST DISTRICT.

While no storms passing across the Lakes during the month caused any disasters, yet there were four or five that gave high and more or less dangerous winds. On the 5th northwest warnings were displayed on the upper Lakes for a storm that developed in the Missouri Valley and moved northeast, closely followed by an extensive area of high pressure from the northwest. This storm had threatening characteristics, but very high winds did not develop. On the night of the 9th storm warnings were ordered displayed for a storm that moved across from the Dakotas. This storm had developed decided energy, but moved across the northern portion of the Lakes. The highest winds of the month attended this storm. On the 19th warnings were displayed for a storm that developed in the southwest and moved northeast, with increasing energy, across the Lake region. This storm lingered over the northern portion of the Lake region for several days, and northwest warnings were displayed on the 21st and over portions of the Lake region on the 22d, practically on account of the same storm. The last warnings for the month were displayed on the 24th for a storm that moved southeastward over Manitoba and crossed the northern portion of the Lake region. With the exception of these storms, remarkably fine weather prevailed, especially during the latter half of the month.—*H. J. Cox, Professor and District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

The month was marked by very fine weather throughout the district. Timely notice of frosts was given to such districts as still needed warnings, but none was issued after the 17th, the close of the crop season.—*F. H. Brandenburg, District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

The month as a whole was marked by unsettled weather, except in the last decade. At San Francisco more than twice the normal amount of rain fell, and in the San Joaquin Valley more than three inches fell, an unusually large amount for that section. On the morning of October 5 light thundertorms occurred in the central portion of the State. Forecasts for showers were made on the mornings of the 5th, 6th, 7th, 8th, 9th, 10th, and 11th. These were verified. Unusually heavy rains occurred in the raisin district on October 5 and 6, accompanied by a thunderstorm. Ample warning was given to raisin growers, and where the warning was not heeded the loss was considerable. Southeast storm warnings were displayed on October 9 from San Francisco northward and continued on the 10th and 11th. These forecasts were made by Mr. George H. Willson, Local Forecaster, in the absence of the district forecaster. From the 14th to the 29th fair weather prevailed generally over the district with fresh northerly wind.

The rainfall in the southern part of California was comparatively light, the disturbances taking a northerly course. There was little or no frost during the month, and but a moderate amount of fog on the coast north of San Francisco. The close of the month was marked by a moderate disturbance, and southeast storm warnings were ordered at 7 p. m., October 29, from Point Reyes to Eureka, and lowered at noon October 30.—*Alexander G. McAdie, Professor and District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

The month of October in the North Pacific Forecast District was a quiet one and no storms of unusual severity oc-

curred. Several minor disturbances, for which storm warnings were displayed, passed eastward near the international boundary line, but as a rule they did not cause winds greatly above the verifying velocities.

Severe frosts, harmful to tender vegetation, were of frequent occurrence in the more elevated portions of the district east of the Cascade Mountains, but in western Oregon and western Washington the temperature was quite mild and only light frosts occurred.—*A. B. Wollaber, Acting District Forecaster.*

WEST GULF FORECAST DISTRICT.

Unusually high temperatures prevailed over the district during the early part of the month, but toward the close of the month the temperature dropped below the normal. The first frost and freezing temperature of the season in the district occurred at Amarillo on the 19th, for which timely warnings had been issued. More general frosts occurred over the northern portion of the district on the 20th, 21st, 23d, 27th, and 28th, and warnings were issued for portions of the district for each of these dates. No severe storm visited the Gulf coast during the month, but high winds occurred on one or two dates, for which timely warnings were issued.—*I. M. Cline, District Forecaster.*

RIVERS AND FLOODS.

River conditions during October did not differ materially from those of the preceding month. There was rather more water in the Mississippi River above the mouth of the Missouri, and somewhat less below. The Missouri, Ohio, and Tennessee were lower, and navigation on the latter remained practically at a standstill.

The crest of the Arkansas flood-wave of the latter part of September passed Wichita on the 8th, when the gage read 4.1 feet. The Canadian flood was the first to reach Fort Smith, the gage at that place reading 14 feet on the 6th. The wave from the upper Arkansas was of much less volume and added only about one foot to the water in the river when it arrived on the 12th.

Detailed reports of the floods of September in the Rio Grande Valley and the mountain districts of New Mexico and Colorado will be found in another part of this REVIEW.

The highest and lowest water, mean stage, and monthly range at 238 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Divison.

The following summaries relating to the general weather and crop conditions during October are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—First two decades warm; last decade rather cold, with killing frost general in some districts, though too late to damage cotton, which was nearly all picked by close of month. Cotton yield generally about average, though slightly above in some localities. Much corn housed, yield good. Minor crops shortened by the drought, which began early in September and continued practically unbroken, and which interfered seriously with many industries. Some oats and wheat seeded.—*F. P. Chaffee.*

Arizona.—Weather generally dry, except in southeastern portion of the territory, but water was fairly plentiful for irrigation and stock. Temperatures averaged slightly below normal, but there was some quite cold weather in northern districts. Crops generally were too nearly matured to be materially injured by the cold weather. Plowing and seeding of grain were in progress during the month. Range feed was plentiful and well cured as hay, promising abundant winter feed. Stock was generally in fine condition.—*M. E. Blystone.*

Arkansas.—Temperature slightly above normal; rainfall deficient, with droughty conditions. Cotton opened rapidly; considerable progress made in gathering crop; picking completed in some sections, nearing completion in others; top crop light. Early corn garnered; late being gathered, almost a complete failure. Conditions unfavorable for fall plowing and seeding; very little done; less than usual acreage sown to small grains. Apples being gathered, yield light, quality fair. Stock not doing well on account of scarcity of water and poor condition of pastures.—*Edward B. Richards.*

California.—Heavy rains in the central and northern sections caused considerable damage to late grapes and slightly injured raisins and prunes on trays, although ample warnings were given. Beans and baled hay were also somewhat damaged. In other respects the early fall rains were of inestimable value, particularly to grass and early sown grain. The soil was in excellent condition, except in the south, and plowing and seeding were progressing. Oranges were coloring rapidly.—*G. H. Willson.*

Colorado.—Month favorable for ripening and harvesting of outstanding crops and fruit. Fall wheat and rye germinated well, but the acreage sown was below the average. Plowing was delayed in localities by the beet harvest, which was probably two-thirds finished by the close of the month. The crop was unusually good, both as to yield and quality.—*N. M. Cunningham.*

Florida.—The month was favorable for picking cotton, the bulk of which was housed. There was a marked deficiency in precipitation in western counties, where seeding for vegetables was retarded. Some small shipments of citrus fruits were made. The tropical storm over southern counties during the second decade damaged some citrus fruits and pineapples. Lowlands were flooded and vegetables were largely ruined; much replanting will be necessary. The month averaged warmer and wetter than the normal.—*A. J. Mitchell.*

Georgia.—The drought continued during the month. Light showers fell on the 3d, 4th, 20th, and 26th. Growing crops seriously injured. Greatest scarcity of water for years; water hauled for stock and machinery. Little fall plowing. Seeded grain failed to germinate. Weather ideal for harvesting; cotton about gathered, staple fine, yield considerably above average. Corn harvesting nearing completion, yield excellent. Temperature about normal. Light frost general 16th, heavy in most sections, killing in north and central on the 23d and 24th.—*J. B. Marbury.*

Idaho.—The month was warmer than the average. Rain in the central and southern sections fell almost entirely from the 6th to the 16th, and in the northern sections from the 6th to the 19th, and on the 30th and 31st; the remainder of the month was bright and pleasant, enabling harvest of late fruits and other fall work to progress rapidly. The apple crop proved to be exceptionally heavy in some localities. Fall ranges were good.—*Edward L. Wells.*

Illinois.—Corn was practically safe in all districts before the coming of killing frosts on the 26–28th. Weather conditions were highly favorable for farm work and the maturing of corn. Considerable husking and cribbing had been done by end of month. General condition of wheat and pastures was quite satisfactory, but rain was needed in some localities. Potato output was above average. Fair apple crop of good quality was gathered in northern half, but light yield of inferior quality was indicated for southern counties.—*Wm. G. Burns.*

Indiana.—Generally killing frost did not occur until the last decade. Practically all corn matured without injury and cribbing began during the last week. Owing to droughty conditions in some southern counties wheat seeding was not entirely finished at the close of October, but generally the crop was up and growing nicely. Rye, clover, and pastures were in good condition. A fairly good crop of potatoes was secured. Apples were mostly gathered, with yield and quality below average. Tobacco was housed. An average crop of tomatoes was canned.—*W. T. Blythe.*

Iowa.—October was warmer and drier than usual. Conditions were favorable for maturing belated portion of corn crop and harvesting potatoes, apples, and vegetables. First general killing frost occurred on morning of 23d. Last decade was rainless and a fair start was made in cribbing corn, with yield above expectations. Pasturage was excellent. Fall wheat and rye made good growth. Fair progress was made in fall plowing.—*John R. Sage.*

Kansas.—Wheat made good progress during the month, and at its close was in fine condition, though in the southeastern and central-southern counties it was needing rain. Corn matured well and was being cribbed. Apples and potatoes were gathered and proved good crops. Range and pastures were good most of the month, and cattle were in good condition.—*T. B. Jennings.*

Kentucky.—Severe drought interfered with wheat seeding, and much of that sown failed to come up. Water for stock became very scarce, and in some localities it was difficult to get enough for household use. The weather was favorable for harvesting late crops. There was a killing

frost on the 27th, but as crops had been secured, no damage resulted.—*H. B. Hersey.*

Louisiana.—Dry month, with abnormally high temperature during the first decade. Conditions were favorable for harvesting crops. Cotton picking was completed in many sections, and was nearing completion generally except in scattered localities where one-fourth or more of crop remained in fields at close of month; yield about average. Fall planting and seeding in northern and central portions delayed on account of insufficient rainfall. Sugar crop heavy, grinding progressing; cane planting well advanced. Rice housed in good condition; yield below average.—*I. M. Cline.*

Maryland and Delaware.—Dry weather prevented much seeding of wheat and retarded germination until the 21st, after which the condition of the crop improved rapidly and was fair to good at the end of the month; an increased acreage was reported in several counties. The excellent corn crop was mostly harvested during the fine weather of the month. Pastures were short, but stock continued in good condition.—*Oliver L. Fassig.*

Michigan.—The weather during October was pleasant and generally very favorable for all kinds of field work and the growth of winter wheat and rye. Wheat was sown quite early this year and germinated finely, and since germination has made good growth. Late potatoes and sugar beets were secured in good condition, and the general yields were good. The potato crop was large and of good quality. Corn husking was well advanced at the close of the month.—*C. F. Schneider.*

Minnesota.—There was much cloudy weather till the 27th, with heavy local rains on the 9th and 19th. Freezing temperatures on the 6th killed everything but hardy vegetation, which was still green at the end of the month. Thrashing, plowing, and potato gathering were nearly finished. Corn husking was in progress during the month.—*T. S. Outram.*

Mississippi.—Extremely dry. Ideal weather for gathering crops. Killing frost in northern and central counties during last decade did little damage. At close of month cotton picking was nearing completion over the eastern and southern portions, and was unusually well advanced west and north; the bulk of the crop was secured in fine condition. Corn, cane, peas, and potatoes generally yielded well. Fall crops were a failure, and there was no fall seeding owing to prolonged drought. Water was very scarce.—*W. S. Belden.*

Missouri.—October weather was ideal for general farm work and for drying out corn. Ninety-five per cent of the late crop had fully matured before the first killing frost, which occurred on the 23d. Very little corn had been cribbed, and almost the entire crop was still in the fields at the close of the month. The earliest sown wheat had come to good stand, but that part of the crop sown later was not up at the close of the month owing to dryness of the soil.—*George Reeder.*

Montana.—The month was abnormally dry and warm. Range feed was fairly abundant in some of the eastern and southern counties; in most other sections it was scarce, except high up in the mountains, where inaccessible on account of distance from water. Fall plowing was much retarded, except where the soil could be moistened by irrigation. Much of the wheat and rye sown had not germinated at the close of the month. Early sown wheat in the counties west of the main divide looked well.—*R. F. Young.*

Nebraska.—October was warm, with ample rainfall. Corn matured fully, even in the latest fields, giving a good crop of excellent quality. Husking was just beginning the last week of the month. Fall sown grain was placed in the ground under unusually favorable conditions, came up quickly, and made a good growth. The Hessian fly was noticed in many winter wheat fields. Pastures were exceptionally good throughout the month.—*G. A. Loveland.*

Nevada.—The temperature was below and the precipitation above normal. Heavy showers during the first decade damaged hay and other crops in various parts of the State. The weather of the latter half of the month was clear and favorable for harvesting outstanding crops. An excellent crop of potatoes was dug and housed in good condition. Live stock as a rule had plenty of feed and were in fine condition.—*J. H. Smith.*

New England.—A severe storm prevailed throughout the district on the 21st, with high wind and gales and general rains. The high winds damaged fruit and shade trees. The weather for the remainder of the month was cool and pleasant and of the "Indian summer" type. Conditions were very favorable for crops and for farming operations generally. In some sections potatoes suffered severely from rot. Pastures and meadows remained green.—*J. W. Smith.*

New Jersey.—The prevailing conditions were exceptionally favorable for all farming operations. A large acreage of wheat, rye, and grass was seeded; good stands obtained, except in the southern section, where a great deficiency of rainfall retarded germination of wheat. Corn husking progressed; yield above average. Apples and pears better than expected. Only a little rot among stored potatoes.—*Edward W. McGann.*

New Mexico.—Heavy rains last of September and first decade of October caused extensive damage to roads, fields, low-lying ranges, hay, alfalfa, and field crops. In the lower Pecos Valley the highest water occurred on the 2d and caused much damage to dams and irrigation ditches. In San Juan County the highest water ever known was experienced on the 9th and very heavy damage resulted. Water abundant, ranges fair, stock in good condition.—*J. B. Sloan.*

New York.—Damaging frosts were general on the 22d and 23d; much damage to buckwheat, corn, apples, and grapes. High winds on the 30th destroyed a third of the apple crop, but a sufficient quantity of excellent quality remained on trees. Fall work was delayed by rains, but the weather was favorable for wheat and rye, which were in excellent condition. Fall feed good; good flow of milk. Yield of hops, beans, and buckwheat about the average.—*R. G. Allen.*

North Carolina.—The month was unusually dry, especially in the western section, where the total precipitation was a trace or none whatever at eight stations. The longest period of drought occurred at Linville, where it lasted from September 5 to October 31, or 57 days. Plowing for winter wheat and oats was much delayed, and fall crops generally were injured by the drought. Cotton was practically all picked, and corn was all gathered at the close of October.—*C. F. von Herrmann.*

North Dakota.—The greater portion of the month was cool and cloudy, with light to heavy rains in the eastern and northern sections, which not only delayed thrashing there, but damaged some shocked grain. The rains were very favorable for fall plowing, however, much of which was done during the month. Considerable grain, mostly wheat, was yet to be thrashed at the close of the month.—*B. H. Bronson.*

Ohio.—The temperature and precipitation averaged below normal. Light frosts occurred during the first half of the month and heavy and killing frosts during the latter half. Wheat looked well, except in the south, where the weather was too dry. Rye was starting well. Corn husking progressed. Potatoes were dug, giving fair yield. Tobacco was curing well. Apples were picked and there was a good crop in the northeast.—*Harry O. Geren.*

Oklahoma and Indian Territories.—Very dry weather and killing frosts caused much damage to growing crops. Fall plowing and seeding progressed slowly, and much wheat was unsown over the southwestern counties, with early and late wheat needing rain to advance germination and growth. The bulk of the cotton crop was secured in fine condition, with fair to good yields of a good staple. Corn, kafir corn, forage crops, and late Irish and sweet potatoes were secured, with fair to good yields.—*C. M. Strong.*

Pennsylvania.—Soil was generally in good condition and farm work well advanced. Early sown wheat and rye were well set and growing rapidly, except in southwestern counties where injured by drought; late sown rather backward but of good color. A heavy corn crop was secured without material damage and husking was well under way. Late buckwheat was damaged by early frosts on lowlands. Late potatoes and winter apples were excellent.—*T. F. Townsend.*

Porto Rico.—Heavy and excessive showers during the first twelve days caused some injury to small crops, but in general were beneficial and relieved the dry condition in the southern division. Cane made excellent progress. Considerable cane was planted for gran cultura. Cotton and coffee picking continued, locally, and some tobacco was sown. The yield of coffee was small as compared with last year. Small crops were generally abundant. Oranges of a good quality became plentiful near the close of the month. Pastures and stock were in excellent condition.—*E. C. Thompson.*

South Carolina.—Month exceptionally favorable for gathering ripened crops. Drought severe over central and western parts, and ground too dry for fall plowing or planting; moisture conditions better along the coast. Cotton all opened and nearly all was picked. Corn was nearly all gathered and other fall crops secured in excellent condition. A general heavy to killing frost on the 24th destroyed some unripe cotton bolls, but did little damage otherwise. The drought was injurious to truck and late root crops.—*J. W. Bauer.*

South Dakota.—Month generally favorable for outstanding crops, seeding and germination of winter grain, and for maturing corn. As a result of September frosts, however, about one-fifth of the corn crop will not be marketable. Thrashing was about finished. A good crop of potatoes was nearly all harvested. At the close of the month winter rye and the limited amount of winter wheat sown were in good condition, range pasturage was good, and the cribbing of corn was well begun. Plowing was rather backward.—*S. W. Glenn.*

Tennessee.—The month was one of the driest in the past 22 years. Plowing and the seeding of winter grains were seriously hindered by the drought. Cotton picking progressed rapidly and by the close of the month most of the crop had been gathered. Tobacco was all housed and cured in fine condition. Corn ripened well and was generally gathered. Heavy to killing frosts occurred about the 21st to 24th.—*H. C. Bate.*

Texas.—Weather conditions were unusually favorable for harvesting operations, but too dry for successful seeding and late forage crops. Frosts were general over the northern half of the State during the last decade, but the injury was immaterial. Rainfall was general, except over the extreme northern panhandle counties, on the 24th to 26th. Saving of cotton crop in excellent condition was completed with practically no loss. Gathering corn well advanced; yield generally good. Good progress made in the cutting and thrashing of rice; crop average. Sugar cane matured nicely and harvesting commenced. Seeding of grain general and active after the rains; increase in acreage probable. Gardens too badly damaged by dry weather to be benefited by rains, ex-

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, OCTOBER, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.							Precipitation—In inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.					Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest. Date.			Station.	Amount.	Station.	Amount.
Alabama	64.6	+ 0.7	Newbern	101	2	4 stations	25 23	0.34	—2.15	Citronelle	2.06	12 stations	0.00
Arizona	63.2	— 0.6	Mohawk Summit	109	5	St. Johns	17 19	0.63	—0.38	Alpine	3.94	11 stations	0.00
Arkansas	62.7	+ 0.6	Howe	100	5	Pond	24 23	0.95	—1.59	Russellville	3.32	2 stations	T.
California	61.6	+ 0.2	Palm Spring	102	3	Bodie	— 2 17	2.74	+1.23	Delta	13.94	8 stations	0.00
Colorado	46.7	— 0.1	Salton	102	3, 4	Breckenridge	— 5 20	0.82	—0.20	Durango	3.39	Grover	T.
Florida	73.3	+ 1.2	Rocky Ford	89	12	Molino	30 25	4.63	+1.20	Jupiter	21.39	Apalachicola	0.00
Georgia	64.6	+ 0.6	Molino	100	1	Clayton	24 29	0.40	—2.49	St. Marys	5.74	5 stations	0.00
Idaho	49.4	.....	Orange City	100	1, 2	Soldier	7 19	1.41	.....	Landore	2.99	Milner	0.47
Illinois	55.1	+ 0.3	Lumpkin	101	2	Dixon	21 27	0.71	—1.45	Zion	2.36	Loami	0.05
Indiana	53.8	— 0.6	Garnet	90	2, 5	Philo	21 28						
Iowa	53.1	+ 1.0	Mascoutah	88	9	Northfield	20 29	1.06	—1.24	Angola	2.54	Hector	T.
Kansas	59.0	+ 1.5	Madison	90	1	Earlham	16 27	1.67	—0.73	Sioux Center	4.43	2 stations	0.14
Kentucky	57.2	— 0.5	Waukee	96	4	Achilles	13 25	1.18	—0.92	Norton	3.65	Macksville	0.10
Louisiana	69.7	— 2.6	Medicine Lodge	96	4	Loretto	20 28	0.52	—1.66	Manchester	1.60	Bowling Green	0.05
Maryland and Delaware	53.6	— 1.9	Irvington	93	9	Jackson	20 31						
Michigan	47.4	— 1.1	Monroe	101	2	Leesville	32 20	0.62	—2.35	South Univ. Farm	2.13	3 stations	0.00
Minnesota	47.4	+ 0.6	Boettcherville, Frederick, Md.	91	10	Plain Dealing	32 29	2.62	—0.60	Darlington, Md	5.30	Solomons, Md	1.13
Mississippi	65.8	+ 1.3	Coldwater	88	10	Grantsville, Md	14 31	2.94	—0.10	Mackinac Island	6.65	Adrian	0.65
Missouri	57.6	+ 0.5	Worthington	82	3	Humboldt	15 23	3.50	+1.30	Maple Plain	6.88	Hallock	0.39
Montana	47.8	+ 2.4	Leakesville	100	1	Pokegama Falls	11 6	0.28	—1.84	Bay St. Louis	2.45	12 stations	0.00
Nebraska	53.8	+ 2.2	Mount Vernon	90	10	Duck Hill	24 25	0.90	—1.55	Miami	2.20	Lamonte	T.
Nevada	47.8	— 1.8	Decker	88	2	Warsaw	19 26	0.30	—0.50	Hamilton	1.29	Miles City	0.00
New England*	46.5	— 3.0	Lynch	95	3	Grayling	9 18	2.44	+0.87	Greeley	6.87	Gordon	0.20
New Jersey	51.9	— 2.4	Caliente	91	4	Agate	12 25	1.20	+1.12	Lewer's Ranch	3.60	Hawthorne	0.13
New Mexico	53.0	— 0.3	Hartford, Conn	81	18	Pioche	6 17	2.25	—1.55	Westfield, Vt	4.19	Berlin Mills, N. H.	0.62
New York	46.7	— 2.3	Vineland	89	10	Chatham, N. H., Westfield, Vt.	11 31	3.78	+0.12	Lambertville	7.01	Atlantic City	1.50
North Carolina	57.7	— 2.1	Carlsbad	96	5	Layton	15 31	1.88	+0.82	Fort Bayard	8.18	Springer	0.05
North Dakota	46.6	+ 4.2	West Berne	84	10	Luna	14 18	3.20	—0.22	Franklinville	6.11	2 stations	1.56
Ohio	52.2	— 1.3	Southern Pines	93	11	Paul Smiths	8 31	1.38	—2.23	Rockingham	4.80	3 stations	0.00
Oklahoma and Indian Territories	63.4	+ 1.2	Dickinson	87	1	Linville	14 24	1.03	—0.12	Ruxton	2.81	4 stations	T.
Oregon	53.4	+ 2.1	Thurman	92	5, 10	Berthold Agency	10 4	1.50	—0.69	New Alexandria	3.55	Green	0.25
Pennsylvania	50.6	— 1.0	Goodwater, Ind. T.	100	5	Orangeville	15 31	0.98	—1.60	Durant, Ind. T	3.42	Frederick, Okla	0.00
Porto Rico	78.0	.....	Erick, Okla	100	3	Vinita, Ind. T	20 3	2.57	—0.31	Gold Beach	8.17	Blalock	0.35
South Carolina	62.4	— 0.6	Grant's Pass	93	1	Cleo, Okla	20 3	2.87	—0.17	Forks of Neshaminy	7.11	Franklin	1.26
South Dakota	51.8	+ 2.9	Irwin	91	19	Klamath Falls	17 17	11.74	.....	Rio Blanco	25.78	San Juan	3.55
Tennessee	58.2	— 0.2	Central Aguirre	99	21	Smethport	12 31	1.10	—2.09	Charleston	4.75	Walhalla	0.00
Texas	68.4	+ 0.9	Clarks Hill	98	12	Adjuntas	56 24	1.78	+0.71	Vermilion	6.67	Rosebud	T.
Utah	48.7	— 0.1	Leola	93	16	Greenville, Santuc	26 24	0.71	—1.73	Wildersville	2.90	7 stations	T.
Virginia	55.7	— 2.0	Waynesboro	92	10	Brookings	17 6	2.89	+0.44	Kopperl	10.50	Jefferson	0.13
Washington	52.0	+ 2.1	Grapevine, Trinity, Waxahachie	102	3	Rugby	20 24, 28	0.92	+0.12	Kelton	3.00	4 stations	T.
West Virginia	54.5	— 0.1	St. George	97	6	Silver Lake	20 24	1.35	—2.03	Dinwiddie	3.09	2 stations	T.
Wisconsin	48.7	— 0.1	Saxe	94	11	Tulia	24 26	1.73	—0.74	Clearwater	7.52	2 stations	0.19
Wyoming	45.4	+ 1.4	Zindel	90	3	Soldier Summit	7 19, 20	1.59	—0.59	Wellsburg	3.02	Green Sulphur Sp'gs	0.40
			Hamlin	92	10	Coyoto	7 19	3.94	+1.35	Medford	8.00	Racine	1.47
			Moorefield	92	1	Burkes Garden	10 24	0.79	—0.02	Alcova	1.90	Lusk	0.00
			Prairie du Chien	85	10, 19	Bayard	16 28, 29						
			Fort Laramie	89	3	Osceola	15 29						
						South Pass City	— 4 18						

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

cept in coast district. Pastures greatly benefited by recent rains.—*William H. Alexander.*

Utah.—Weather conditions were very favorable for farm work. Opportune rains during the fore part of the month placed the soil in fine condition for plowing, and fair weather later enabled this work to be pushed vigorously. At the close of the month early sown wheat was coming up in localities and doing well. The acreage sown to fall grain showed a large increase over that of last year. Beet gathering continued, with the yield generally above average. Ranges were fine, feed plentiful, and stock thriving.—*L. Lodholz.*

Virginia.—The progress of crops throughout the major part of the month was considerably retarded by dry weather. Late seeding of turnips, wheat, oats, and clover advanced very slowly until the 20th, when a general rain fell in all portions of the State, except the southwest, and fall crops and pastures were much improved. The end of the month found crops in all sections in better condition than at the beginning.—*Edward A. Evans.*

Washington.—The temperature was mild and very uniform, and there were many days without rain; therefore the month was very favorable for gathering late crops, such as potatoes, root crops, fall vegetables, and apples. Wheat sown in September and during the first week in October was put into very dry soil. The copious rains of second decade germinated the wheat and put the soil in condition for seeding, which continued the remainder of the month.—*G. N. Salisbury.*

West Virginia.—The weather during the month was very dry, with killing frosts. Fall seeding was about completed, but wheat was germinating slowly and doing poorly on account of lack of moisture. Pastures were dried up, and the prospects were that feeding would begin earlier than usual. Stock were in fairly good condition. But little corn was husked, as fodder was too dry to handle. Apples were mostly gathered, but were rotting quite badly.—*E. C. Vose.*

Wisconsin.—The heavy and continuous rains during the first decade interfered with the digging of potatoes to some extent, but resulted in no material damage to the crop, which was large and of excellent quality. Winter wheat and rye made excellent growth during the month. Fall work was well advanced. The latter part of the month was mild and very pleasant.—*W. M. Wilson.*

Wyoming.—The month was unusually pleasant throughout the State, there being an average of 19 clear days during the month for the State. The temperature extremes were not unusual, and the precipitation averaged about normal. The month was extremely favorable for all live stock which were in excellent condition. The ranges afforded good feed for stock.—*W. S. Palmer.*

SPECIAL ARTICLES.

STUDIES OF RAINDROPS AND RAINDROP PHENOMENA.

By WILSON A. BENTLEY. Dated October 1, 1904.

Our knowledge in regard to the mechanism of rain formation, i. e., the precise manner in which the nucleus of each raindrop is organized and the method by which the aqueous material is added to the nucleus during its growth, so that eventually raindrops of considerable size are produced, has hitherto been very unsatisfactory. Equally so is our knowledge of the actual altitudes within the clouds at which various rainfalls originate, the relative quantities of rain precipitated from different clouds and storms, the dimensions of the individual raindrops, and their variation in different storms and in different segments of the same storm. The desire to add, if possible, a little to our knowledge regarding rainfall phenomena led the writer, in the autumn of 1898, to undertake a systematic study of the various rainfalls occurring at his locality. This study was continued during the six following years—1899 to 1904, inclusive—up to the date of this writing.

I. METHODS OF OBSERVATION.

During this period hundreds of samples of raindrop impressions were secured, including raindrops emanating from various storms, clouds, etc. The method employed was to allow the raindrop to fall into a layer one inch deep of fine, uncompacted flour, with a smooth surface, contained in a shallow tin receptacle about four inches in diameter, which was generally exposed to the rain for about four seconds, although a longer time was given when the drops fell scatteringly. The raindrops were allowed to remain in the flour until the dough pellet that each drop always produces at the bottom of the cavity was dry and hard. These dough pellets, which were found by careful experiment to correspond very closely in size with the raindrops that made them,[1] were then extracted, labeled and, photographed, or kept on file for reference, together with the attendant meteorological data, such as temperature, height of clouds, kind of storm, etc. Though some of the large drops were somewhat flattened by their impact upon the flour (and the pellets thus made were similarly modified), yet, on the whole, this method of securing raindrop impressions and of ascertaining their relative dimensions proved very satisfactory.

The kind of storm, and the segment of the storm from which raindrops emanated, hour of the day, temperature, the kind and approximate height of clouds, their vertical dimensions, etc., and the occurrence or absence of lightning within the rain producing clouds directly over our locality were noted and filed with each sample of pellets. Some 344 sets of raindrop impressions in flour, each containing a large number of individual raindrops, were secured by this method from 70 different storms.

These samples portray the general character of the rainfall, as it occurred during the progress of 15 general rainstorms, 30 local showers and rains, and 25 thundershowers. A few of these samples represent merely isolated, incomplete cases, but most of them are complete sets and portray the character of the rainfall, relative size of drops, etc., throughout the whole cross section of a storm or shower, from the advancing to the receding edge. (See figs. 1 to 11. These photographs are the same size as the originals.) As our study progressed from year to year facts of much interest were brought to light, and, altogether, it proved very interesting and instructive.

[1] Drops of water about $\frac{1}{12}$ of an inch and $\frac{1}{6}$ of an inch in diameter, suspended from the end of a broom splint and from a glass pipette, respectively, were carefully measured, and then allowed to drop into flour from heights of from 12 to 30 feet. The smaller pellets ($\frac{1}{12}$ of an inch) were of so nearly the same diameter as the artificial raindrops that it was difficult to detect any difference, although in some cases the pellets were slightly flattened by impact, with a corresponding slight increase in the longer diameter. The larger artificial raindrops ($\frac{1}{6}$ of an inch) produced pellets that were considerably flattened and had a longer diameter, exceeding by about one-third the diameter of the drop. Singularly enough, they were more flattened than was often the case with pellets obtained from the large drops of actual rainfall.

II. DIMENSIONS OF RAINDROPS.

Perhaps the most remarkable fact, early brought to our notice, was the astonishing differences in the dimensions of the individual drops, both in the same and in different rainfalls. While the larger ones sometimes possessed diameters of $\frac{1}{4}$ and even $\frac{1}{3}$ of an inch, the smaller ones were but $\frac{1}{32}$ to $\frac{1}{50}$ of an inch in diameter, and the occurrence of microscopic drops too minute to make an impression in flour (whose dimensions were probably less than $\frac{1}{100}$ of an inch), was quite frequently noted. For the convenience of the reader, the various data have been compiled, so far as possible, in tabular form. The relative frequency of the occurrence of raindrops of various dimensions as they appeared in the 344 samples from the various storms is given in Table 1. In the tabular classification of the drops, the following approximate dimensions were used to designate each group. Those termed "very large" exceeded $\frac{1}{5}$ of an inch in diameter; those designated "large" were from $\frac{1}{7}$ to $\frac{1}{5}$ of an inch; "medium," $\frac{1}{10}$ to $\frac{1}{8}$ of an inch; "small," $\frac{1}{30}$ to $\frac{1}{15}$ of an inch; "very small," all whose diameter was less than $\frac{1}{30}$ of an inch.

TABLE 1.—*Number of samples, out of a total of 344, in which drops of various sizes were found.*

Size of drops.	Number.
Very small	149
Small	288
Medium	254
Large	141
Very large	35

As will be noted, the "small" and "medium" drops occur most frequently, each of them appearing in almost three-fourths of the samples, and next to them in the order of frequency come the "very small" and the large drops, each in nearly one-half of the samples. The very large drops were relatively rare, occurring in only 35 (or about one-tenth) of the samples. Although the small and medium-sized drops greatly outnumber the larger ones, it is to be noted that it does not follow from this that they furnish the bulk of the rainfall.

III. DISTRIBUTION OF DROPS.

In Table 2 the distribution of each of the various sizes of raindrops, or the number of occurrences within the various segments of rainstorms, is given. In compiling Table 2, only complete or nearly complete sets of raindrop samples were consulted, as was evidently necessary in order that the data should be homogeneous. These samples represent the distribution of raindrops within the various segments of 51 different storms, i. e., 9 general rainstorms, 23 thundershowers, and 19 rain showers.

TABLE 2.—*Distribution of drops of various sizes over 51 storm areas.*

Size of drops.	East edge.	East portion.	Central portion.	West portion.	West edge.
Very small	18	15	20	21	33
Small	37	41	46	32	32
Medium	30	42	42	46	27
Large	18	26	23	23	8
Very large	3	4	8	7	0

It appears that in general the very small drops increase in number from the east edge toward the west or receding edge of a storm, and that of the drops of other sizes, each, as a rule, shows a progressive increase toward the center of a storm, but then decrease toward the west edge. While this law of dis-

tribution seems to be true as regards the raindrops precipitated from the whole number of storms under consideration, the exceptions to it are not rare, especially as regards certain kinds of storms. As an instance in point, the data seem to strongly indicate that there is a paucity of large and very large raindrops within the central portion of the larger and older thundershowers, as compared with certain outlying portions. (See fig. 9, showing a photograph of a sample set of raindrops collected from a large and old thundershower.)

In general, the large and very large raindrops appear in much greater numbers and form a much greater percentage of the rainfall of the extra central, western, or receding storm segments than of that issuing from other segments. It seems to be a fact that, in general, showers renew themselves or acquire new vigor within the western or receding segments. It has been very frequently noted that the vast masses of low clouds (nimbus?), that might not inaptly be called "storm feeders," commonly existing within the central and western storm segments, attain to their largest dimensions therein. Indeed, they ofttimes attain to such vast vertical dimensions that their expanding summits reach up to and merge into the cirro-stratus crest canopy of the primary storm, until at last they develop and transform themselves into secondary showers, becoming heavy rain producers themselves, as annexes to the primary showers.

IV. INFLUENCE OF KIND OF CLOUDS.

Another aspect of our study, viz, the character and amount of the rainfall that emanates from different clouds and from various combinations of clouds, both when existing separately one above the other and when intermerging one with another in continuous vertical masses, is of great interest and has received a large measure of attention. In general, two or more cloud strata exist when rain is falling; from some varieties of clouds precipitation, at least in appreciable quantities, rarely or never occurs. If rain occurs when two distinct and widely separated cloud strata exist, it by no means follows that both of them are rain producers. On the contrary, it often happens that but one of them contributes rain or snow.

Table 3 gives the number of occurrences of raindrops of various dimensions as precipitated from different clouds and combinations of such one with another.

TABLE 3.—*Size of raindrops received from each kind of cloud.*

Kind of cloud.[2]	Size of raindrops.				
	Very small.	Small.	Medium.	Large.	Very large.
Cumulus alone, 30 samples	7	19	17	6	0
Nimbus or low stratus, 20 samples	14	12	4	0	0
Cirro-stratus, 33 samples	15	26	16	4	0
Cumulus and nimbus, 25 samples	19	25	20	4	0
Cirro-stratus and nimbus, 90 samples	43	58	48	20	1
Cirro-stratus and cumulus, 53 samples	10	36	44	26	11
Cirro-stratus, cumulus, and nimbus, 84 samples	30	82	84	80	23
Cirro-cumulus, 7 samples	3	5	2	0	0

[2]The term "nimbus" is here confined to low-lying clouds commonly seen in detatched masses scudding swiftly below higher clouds.

In analyzing the data of Table 3, perhaps the most important point clearly elucidated therein is the fact that (with one exception) all the "very large" raindrops and about three-fourths of the "large" ones emanated from compound cloud masses whose vertical dimensions were very considerable. It is worthy of note that all the data and observations seem to lead to the conclusion that, in general, the size of each individual raindrop depends largely, if not wholly, upon, and increases with, the square of the mass of upper and intermediate clouds that each drop passes through on its earthward journey.

The frequency of the occurrence of the various sizes of raindrops from various clouds, as given in Table 3, is most interesting and instructive. Considering it more in detail, we find that the simple low-lying cumulus clouds, the nimbus, the cirro-stratus, and cirro-cumulus, and the "cumulus and nimbus," produced no "very large" raindrops, and that these kinds of clouds gave altogether only fourteen samples containing drops classed as "large." It seems that practically the whole of the rainfall shed from these low and intermediate clouds consists of "very small," "small," and "medium" raindrops. See figs. 1 and 2 for photographs of raindrops shed from low nimbus and cirro-stratus clouds, respectively. The largest percentage of "very small" drops occurred in the samples of rain shed from low nimbus (or low stratus?) clouds. (See fig. 1.) These various clouds (except the cirro-stratus) represent practically all of the cloud forms that exist at low and intermediate altitudes, and the fact that they rarely shed raindrops of large size is very significant and instructive, and has an important bearing on theories hitherto generally accepted.

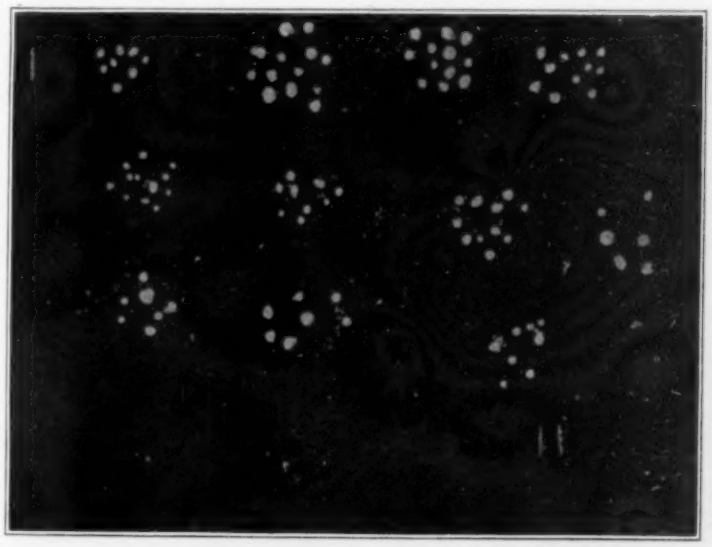

Fig. 1.—Raindrops from low nimbus clouds, taken at different dates.

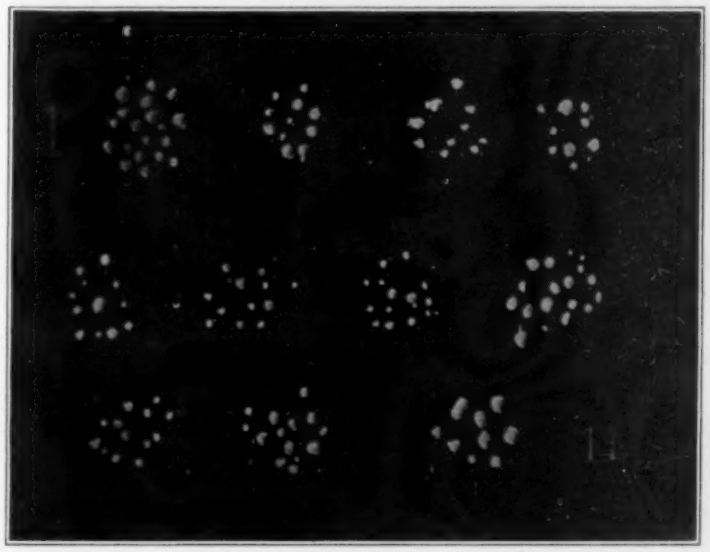

Fig. 2.—Raindrops from high cirro-stratus clouds, taken at different dates.

Analysis of the rainfalls of the high cirro-stratus alone, which are supposed to be due to the melting of snow crystals that issue from such clouds (see fig. 2), reveals the interesting fact that the raindrops, in general, correspond, as regards size, with the minute snow crystals that commonly issue from such high clouds in winter. "Small," "very small," and "medium"

drops constitute the bulk of the rainfall of these lofty clouds. It would seem to be a fact that high clouds alone and low clouds alone, or, in fact, any clouds or combination of such lying and moving in horizontal strata, or possessing purely horizontal motion, are incapable of precipitating the large raindrops. These seem to be peculiarly the product of clouds that extend and move vertically. Often the high cirro-stratus clouds are associated with others lying at vastly lower levels, called the "nimbus" or, by some, "low stratus." This cloud combination, although occasionally present during showers, especially old ones, is yet peculiarly a general storm-cloud combination, and much the larger portion of the rainfall during general storms issues from such widely separated but associated cloud strata. The cirro-stratus, the upper component of this combination, exists at frigid altitudes, and almost certainly precipitates moisture only in the form of snow, while the nimbus, or lower component, with equal certainty sheds moisture only in liquid form, as minute raindrops. The larger raindrops are rarely shed from such clouds, though those of quite large dimensions sometimes are. Small to medium drops constitute the majority, though very small and microscopic drops are greatly in evidence. Photographs of raindrops shed from these associated general storm-cloud strata are given in figs. 3, 4, 7. Fig. 4 portrays the character of the rainfall during the progress of a general rainstorm from the far south—a West Indian storm, which was accompanied by lightning during its latter stages.

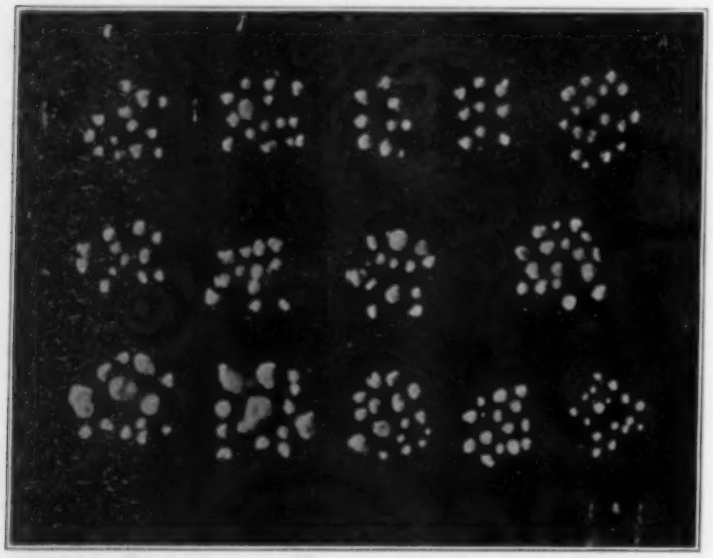

Fig. 3.—Complete set of samples from the great general storm of August 20, 1904. Duration of storm fifteen hours. One raindrop sample per hour was taken throughout storm.

Consider that portion of the data of Table 3 treating of the rainfall shed by higher, thicker, and more complex cloud masses. The combined intermerging cumulus and cirro-stratus are often heavy rain producers, and demand special consideration. The very large number of medium-sized drops present within the samples from these clouds is very noteworthy, as is, also, the considerable number of large and very large drops. These clouds, when so commingled, often possess great depth, and a large percentage of their proper motion, or expansive drift, is upward in a nearly vertical direction.

We now pass to a consideration of the rainfall shed from cloud masses possessing the maximum of thickness and complexity, i. e., the combined intermerging nimbus, cumulus, and cirro-stratus. See figs. 6, 10, and 11 for photographs of typical samples. This cloud combination, though occasionally met with in general storms, is peculiarly a thunderstorm-cloud combination. Such complex cloud masses often possess vertical dimensions of five or six miles, and occasionally attain, according to some observers, dimensions exceeding ten miles in thickness. Much of the expansion of such clouds, and especially is this true of newly formed showers, is exerted in a vertical direction, and a very large percentage of the moisture precipitated from them must, presumably, traverse through great distances of very dense mist or snow laden clouds before reaching earth. The character of the rainfall shed from such highly composite cloud masses is, as might be readily supposed, diversified, and each group or kind of raindrop is well represented. The large drops among the samples are almost as frequent as those of medium and small size. The very large drops form a much larger and the very small ones a much smaller percentage of the total rainfall than is usual.

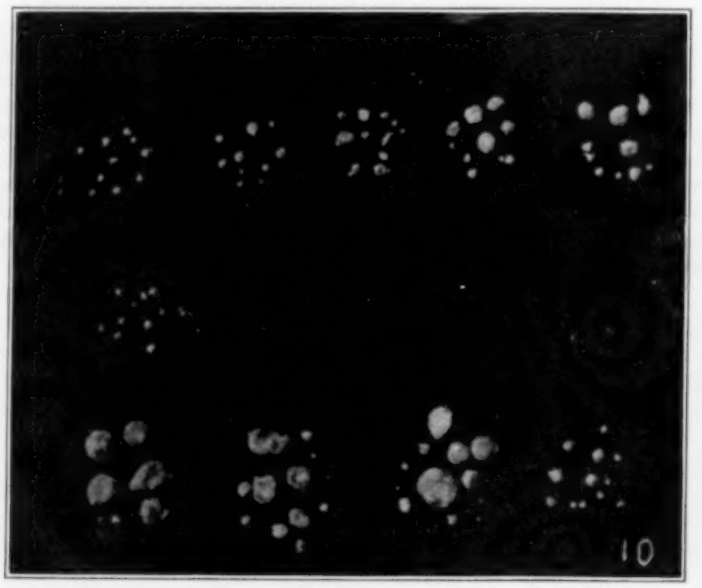

Fig. 4.—Raindrops of great West Indian general storm of July 9, 1899. Duration, sixteen hours. Sample taken throughout day of July 9, one sample every seventy minutes.

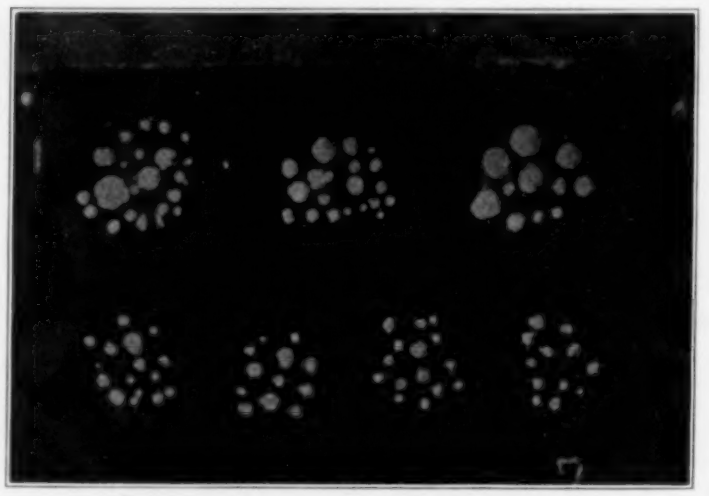

Fig. 5.—Raindrops of large and old thunderstorm of May 25, 1904. Duration, fifty minutes. One sample taken every seven minutes. Last four samples were from high cirro-stratus clouds.

For the reason that the larger raindrops are shed in considerable numbers only from thick, vertically expanding, complex clouds of this character, we may infer that the larger raindrops, whenever produced, are those that originate highest above the earth, and presumably as snow. From this it follows that whenever the rainfall consists wholly or partly of such large drops, the presence of vast vertically extending

cloud masses is almost certainly indicated. This fact should possess much value in connection with cloud study and other meteorological work, because it enables us to quite certainly determine the presence or absence of such thick cloud masses within the various segments of storms, when their existence can not otherwise be ascertained by direct vision, owing either to the presence of dense masses of low clouds, or to the thickness of the rainfall.

V. STUDY OF THE INITIAL RAINFALL.

The first rainfall or precipitation that occurred from newly formed or forming showers received particular attention, because it must reveal the character of the rainfall resulting from the initial efforts of the rain-producing agencies and also because of its unusually large percentage of very large and large drops. These large drops give ample demonstration of the unusual vigor with which these initial rain-making operations are carried on. For photographs of typical sets of raindrops of newly formed thundershowers see figs. 8 and 11.

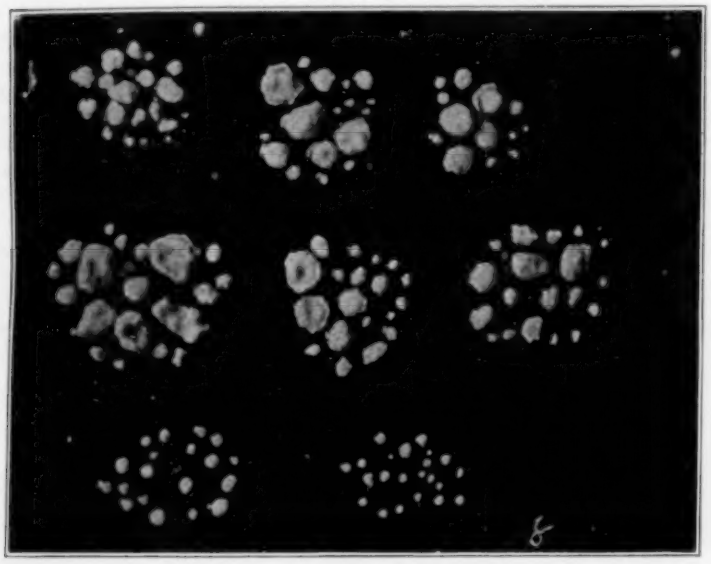

Fig. 6.—Large thundershower raindrops of September 20, 1904. There were dense, low, nimbus clouds throughout this shower. Duration, one hour. One sample taken every seven minutes.

The unusual character of such rainfalls is well shown in Table 4, and by the photographs. The large and medium sized drops appear in even larger numbers than do those of smaller denominations. The "very large" ones occur in one-third of all samples, while the "very small" ones are almost unrepresented.

TABLE 4.—*Relative frequency of the appearance and distribution of the drops within the various segments of newly formed showers. Eight different rainfalls, 45 samples.*

Size of drops.	Segment of storm.					
	East edge.	East portion.	Central portion.	West portion.	West edge.	Total.
Very small	1	1	0	3	1	6
Small	5	8	6	8	8	35
Medium	7	8	8	8	8	39
Large	4	8	8	6	5	31
Very large	2	4	2	6	1	15

VI. LIGHTNING AND RAINDROPS.

The character of the rainfall in connection with the occurrence of lightning received, during our study, a large measure of attention. The endeavor was made to ascertain whether any connection actually exists between the raindrop dimensions, the copiousness of the rainfall, and the presence or absence of lightning.

The first column of Table 5 gives the general character of the rainfall, as shown by the 76 samples obtained during the progress of 25 thundershowers. It is to be noted that when these samples were taken the lightning occurred directly overhead, as distinguished from that occurring at a distance.

The unusually large percentage of the numbers of occurrences of "large" and "very large" raindrops will be noted, and is very significant and instructive. It was frequently noted that whenever the electric discharges were unusually frequent and powerful the rainfall was unusually thick and heavy, and consisted of raindrops of all sizes, the larger ones predominating.

It was thought best, in view of the importance of this subject, to compare this with similar data from other rainfalls unaccompanied with lightning and also with data from thundershowers in which the electric discharges occurred at some distance away from that portion of the shower that furnished the raindrop samples. To this end, a similar number of samples, i. e., 76, from each of these kinds of rainfall was examined, and this data is also shown in Table 5.

TABLE 5.—*Size of raindrops during lightning.*

Size of drops	Storms with lightning overhead.	Storms with distant lightning.	Storms without lightning.
Very small	15	31	38
Small	61	67	70
Medium	64	63	57
Large	58	23	22
Very large	23	3	1

The data here given afford good ground for the belief that a connection actually does exist between the dimensions and relative frequency of the raindrops and the occurrence of lightning. It may be added that, irrespective of direct raindrop testimony, this conclusion is very strongly supported by a number of independent observations of the portions of the clouds wherein the electric discharges originate. In general the latter were observed to originate within (as distinguished from merely passing through) the thickest and densest portion of each shower under observation, and it was quite certain that from this portion the heaviest rainfall and largest drops were being precipitated. Lightning seems rarely to occur when the raindrops fall scatteringly; although in such cases the drops are almost invariably of very large size.

Fig. 7.—Samples from general rainstorm. Taken in 1899.

Touching this point (thickness or thinness of the rainfall) the testimony of the raindrops of the 76 samples secured when

lightning was directly overhead is of interest. Our notes show that the rainfall was very thick and heavy as regards 33 of them, was moderately thick and copious as regards 31 of them, and was thin or scattering in only 13.

As is well known, electricity, or electric charges, exist upon, or confine themselves to, the surfaces of objects, as snow crystals, raindrops, etc. It may well be that the cause of lightning, or rather the causes that operate to impart excessive electric charges to the raindrops, the collective discharging of which produces the phenomenon of lightning, may be largely due to processes in operation far up within the clouds, where congelation and crystallization take place. Snow crystals are frequently, if not invariably, highly charged with electricity. Moreover, such crystals and granular snow nodules possess enormously large surfaces, as compared with their bulk. Their conversion into raindrops would enormously reduce the surface area of the transformed, consolidated aqueous mass, and would accordingly transfer and concentrate upon a single vastly smaller globular surface, i. e., the surface of a single large raindrop, the charges formerly disseminated over the surfaces of one or perhaps a large number of snow crystals, or flakes of snow, or granular snow pellets. It is quite conceivable that the larger drops, at least, may often receive in this manner electric charges far in excess of what they can retain, and especially may this be true, when, in addition, they receive supplemental charges by overtaking and merging with smaller drops while falling. In this connection, it is of interest to state that the few instances on record (in autumn and spring) when the snow from thundershower clouds, owing to the relativaly low temperature, descended unmelted to earth, so that its character reveals itself, it was found to consist of large pyramidal-shaped granular snow pellets.

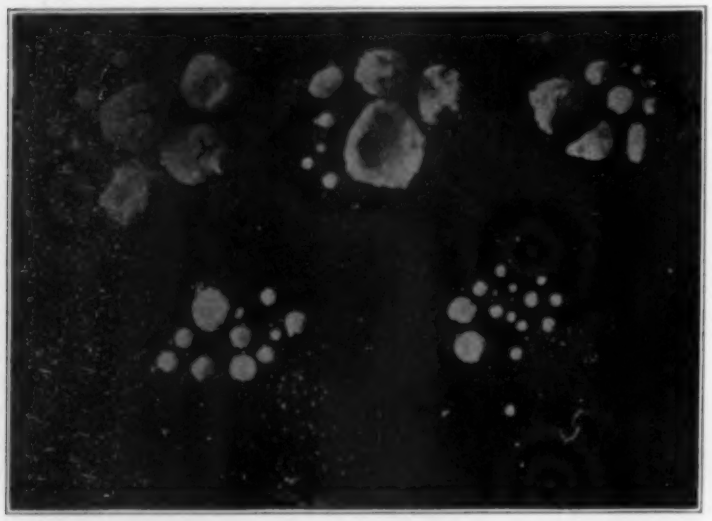

Fig. 8.—Rather small, newly formed, thunder and hail shower. July 1, 1904. Duration, fifteen minutes.

It is to be noted that the surface area of a given mass of aqueous material in the form of mist drops is enormously reduced merely through its conversion into granular snow, because granular snow itself is formed through the condensation of myriads of minute rain or mist drops upon snow nucleii, and their subsequent conversion thereon into ice by freezing.

Concerning the many minor phenomena connected with the formation and precipitation of rain, one that is of considerable interest and at times seemingly inexplicable is the descent to earth (often simultaneously with vastly larger drops) of great numbers of exceedingly minute microscopic raindrops, presumably less than $\frac{1}{100}$ of an inch in diameter, and so very light that they descend quite slowly. This phenomenon, which occurs during very violent, as well as during gentle, rains and showers, would seem to furnish reasons for supposing that the air directly beneath such showers does not move violently upward and enter the vortex of such storms. It is obvious that if it did it would buoy up, or carry upward with it all such light minute raindrops, and prevent their descent to earth. The inference seems plain that the warm, moisture-laden, inflowing lower air that supplies such storms with fresh quantities of moisture is drawn from some distance away from, and around them, and undergoes its initial expansion before it reaches the near vicinity of such storms, and hence flows into them as somewhat elevated, horizontal, converging air currents.

VII. WEARING AWAY OF RAINDROPS WHILE DESCENDING TO EARTH.

A factor of some importance, though perhaps not often considered, is the erosive and evaporative action upon the falling raindrops or snow crystals of the relatively dry and cloud-free air spaces between two clouds, or, more particularly, between cloud and earth. Each raindrop doubtless loses appreciably through this cause, and (barring collisions and merging with its fellows) is somewhat smaller when it reaches the earth than when it first left the clouds. The percentage of loss that each raindrop undergoes must obviously vary from time to time, with varying conditions. As is well known, raindrops of considerable size are sometimes completely evaporated while passing through warm, dry air, and fail to reach the earth. Such phenomena are sometimes noted over desert regions, where considerable rainfalls may be dissipated in this manner. Reasoning from the foregoing, and from other observed facts, it seems quite certain that rainfalls consisting of microscopic drops may quite often be shed from large cumulus and other clouds (although of course in minute quantities only) and yet fail to come under our observation, because reabsorbed while on their earthward journey.

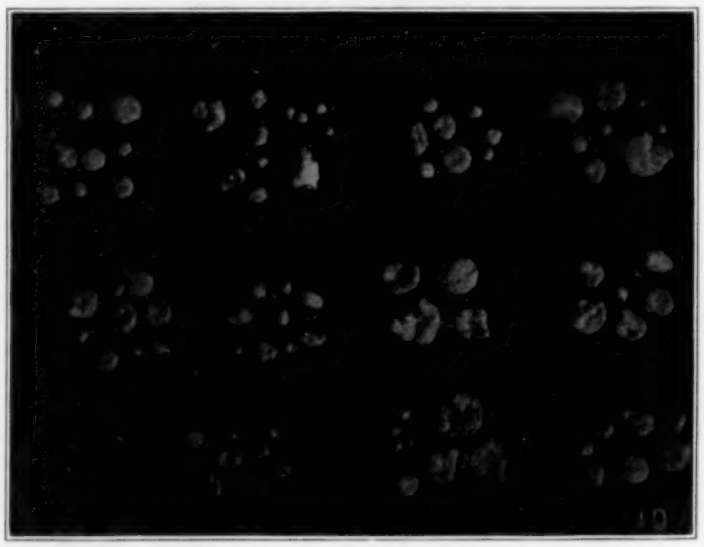

Fig. 9.—Thundershower raindrop samples. Taken in 1899.

A phenomenon of much interest and significance, and one that would seem to nullify some accepted theories, is the occasional occurrence of rainfalls consisting entirely of drops of nearly uniform size. The drops are sometimes of large and sometimes of small dimensions, and they have been seen to fall both thickly and scatteringly. Although not common, yet rainfalls of this character, and particularly isolated samples, taken at one time and another during various rainfalls, are far from rare; 26 samples, among our total of 344, were of this character. Two of these consisted of very small drops, nine of small drops, ten of medium drops, and five of large or very large drops. In addition, many samples (though not

so classed) consisted almost wholly of uniform drops. It seems impossible to conceive of any combination of circumstances or action of natural forces, whether by liquid merging, condensation, or otherwise, by which all the myriads of small raindrops which, according to the theory of liquid merging, must fill the cloud spaces and regions far below them, could be drawn, forced, or merged together, and incorporated within the uniform sized raindrops, so that the latter only would be left to fall to earth. We seemed forced to the conclusion that such uniform sized drops, and especially the larger of these, are due to the melting of snow crystals or granular snow. As is well known, snowfalls often occur in which the individual crystals, or granular snow pellets, are of practically uniform dimensions.

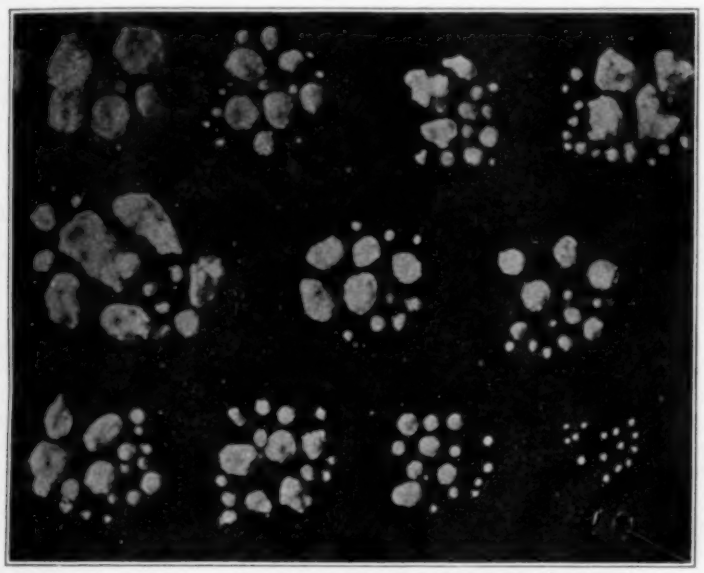

Fig. 10.—Great thundershower of September 3, 1904. Shower was accompanied by vivid and frequent lightning. Duration, one hour. One sample taken every five minutes.

VIII. DUAL ORIGIN OF RAIN.

In view of all the facts and data at hand, we seem to have the best of grounds for assuming that rain often has a dual origin; that there are, in general, two distinct processes concerned in the formation and precipitation of rain, or of snow from which rain ultimately results. These processes might not inaptly be termed the fluid and the solid (or crystalline or snow) processes. Though each of these processes may and doubtless often does precipitate moisture independently of the other, more frequently they unite and aid or supplement each other in the work of rain making. Granting the truth of this "dual" theory of rain formation, all the seemingly inexplicable phenomena connected with the formation and precipitation of rain, such as the manner of the growth of raindrops and their attainment to a large size, the formation of uniform sized drops and of large, scattering drops, the occurrence of perpetual snow upon the summits of isolated peaks, even in the Tropics, etc., become plain and are easily and completely explained. It now becomes of much interest to ascertain which process performs the major part of the work of rain making. Our present knowledge regarding this point is yet incomplete, but the data so far collected, as well as the inferences to be drawn from well-known general facts and considerations, point strongly to the conclusion that the crystalline or snow process performs the major part. Reasoning from the well-known laws governing the precipitation of solids from a fluid or liquid medium, it is obvious that the lower air (which, it is to be noted, contains the bulk of the moisture within the atmosphere) can not, in general, precipitate large quantities of moisture in the form of rain or snow until it is carried upward to considerable heights, and is greatly cooled thereby. Almost invariably, while showers and rainstorms are in progress, extensive air spaces exist between cloud and earth that are, by nature of their relatively higher temperatures, actually dry and vapor thirsty. Usually these air spaces are from 3000 to 5000 feet thick and free of clouds of any kind. Such cloud-free air spaces do not even hold all the moisture they can hold in solution in an invisible state, as otherwise clouds would inevitably form and fill the whole space between cloud and earth. The base of the lower cloud strata is merely the boundary, the meeting point, of two volumes of air, the upper of which is over saturated, and becomes more so with increase of altitude; the lower one is not saturated with moisture and becomes progressively drier (because its temperature increases) as the earth is approached. Obviously, then, at the base of the clouds (and for some distance upward) the air does not contain much more moisture than it can hold in an invisible state, and, accordingly, is far from being in a condition to precipitate large amounts of rain or snow.

We may rightly conclude that the rainfall shed from such low clouds consists wholly of small raindrops, and is in inconsiderable quantities. From this it follows that we must look to altitudes much more lofty for the source of those enormous quantities of water that often fall during our heavy rainfalls. This region of what we might term maximum precipitation may be assumed to vary greatly in altitude according to time of year, violence of storm, etc., but, in general, its altitude must be so great that it is quite certain that much, probably the the major part, of its moisture is precipitated in the form of snow. Since particles of moisture precipitated within this region and within the summit portions of the storm clouds are colder than those of lower cloud levels, and have an opportunity of collecting cloud and mist particles throughout the whole vast extent of the clouds below them, they must ultimately attain to much larger size than those from lower regions, and can thus be distinguished from them. Assuming, accordingly, that the larger raindrops issue from the upper portions of the clouds and are due to the melting of snow, or, conversely, that the smaller ones originate by liquid processes alone within the lower clouds, we have a means of approximately ascertaining which process produces the major part of the rainfall. We have only to group together the individual raindrops (flour pellets) within the samples secured during various rainfalls, and weigh each group separately. Samples containing 244 individual raindrops from four typical thunder clouds were used for this purpose. The number of large and very large drops within these four samples numbered 63, and weighed 26 grains, troy. The number of medium, small, and very small raindrops numbered 181, and weighed 11 grains, troy. Assuming these respective groups, and weights, to approximately represent the portions of the rainfall due to the melting of snow, and to purely liquid processes, it would seem that the major portion of the rainfall of thundershowers is of a snow origin.

Regarding the rainfall of general storms, the portions of the rainfall respectively due to the melting of snow, and to liquid processes alone, are most difficult of estimation, because often a portion of such rainfall, although consisting of small raindrops, emanates from the high cirro-stratus clouds, and is almost certainly due to the melting of minute snow crystals. However, the bulk of the rainfall usually emanates from certain circumscribed portions of such storms, and this major portion (heaviest rainfall) often consists of large, medium, and small raindrops, and approaches in character somewhat closely to that shed from thundershowers. Moreover, the clouds within such portions of general storms are often thick and extend upward to vast heights, and the places of origin of the various denominations of raindrops within them are probably

not very different from those of thundershowers. For comparison, four samples of raindrop pellets from general storms, taken during heavy rainfalls, were consulted, and the drops grouped, divided, and weighed in the same manner as in the case of the thundershower samples. The four samples contained 205 raindrops. But ten of these were of large size, though there were 46 of medium size. The number of small and very small drops numbered 149.

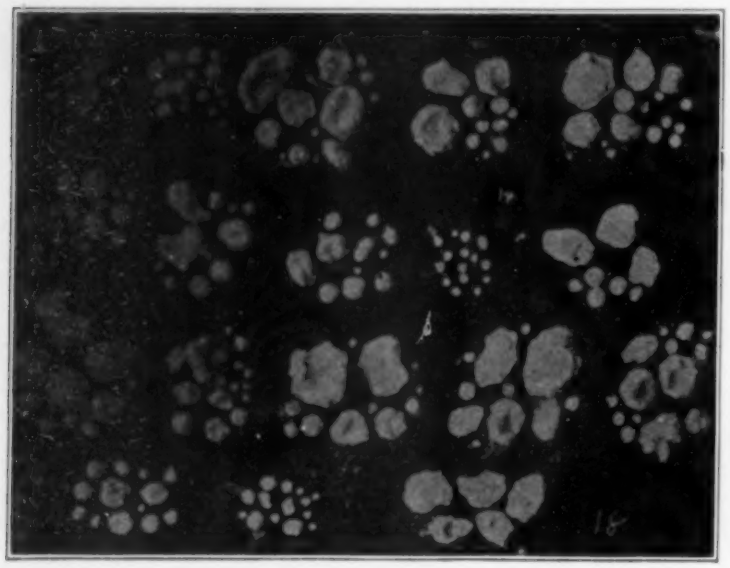

Fig. 11.—Great thundershower, newly forming, of August 14, 1904. This shower was accompanied by vivid and frequent lightning, and underwent many partial intermissions and renewals. Duration, fifty-five minutes.

The large and medium drops were grouped into one class, and the small and very small into another, and weighed. The former weighed 6 grains, troy, the latter 4 grains, troy. This would seem to indicate that the major portion of the rainfall, even during general rainstorms, emanates from great heights, and is probably traceable to snow origin. It is true that in making these estimates no allowance has been made for the liquid raindrops and aqueous material that, through merging and other processes, were probably added to and incorporated with those classed as of snow origin. This may sometimes, and in some instances, be considerable. But after making all due allowances for this and other uncertainties, the fact remains that the very large and possibly the major portion of the rainfall in all climes is due to the melting of snow flakes or granular snow. As having a bearing on this point, it may be well to quote Mr. Maxwell Hall, of Jamaica (see MONTHLY WEATHER REVIEW for May, 1904, page 230). Mr. Hall, referring to the expansion of the cumulus clouds and the conversion of their summits (while mushrooming out) into cirro-stratus clouds, says: "By means of a sextant it was found that the average heights of such well-formed rain producing cumuli was as much as six miles. At this elevation the temperature is below zero, and strato-cirrus must consist of fine snow. This fine snow ultimately falls by its own weight, and, melting, produces those gentle after rains that follow the heavy rains and squalls of the (central) cumulus." The photographs of thundershower raindrops in figs. 5 and 6 illustrate the general character of the rainfall of such showers as Mr. Hall describes. Groups 1 to 3 of fig. 5, and 1 to 6 of fig. 6, are typical of the heavy rains of the central cumuli, while 4 to 7 of fig. 5, and 7 and 8 of fig. 6 are typical of the gentle rains due to the melting of the snow crystals shed by the cirro-stratus clouds, such as Mr. Hall mentions. Sometimes such striated cirro-stratus clouds assume curious rounded flocculent shapes or convolutions, their under sides seeming, in fact, to bulge downward in places, and groups 4 to 7 of fig. 5 possess unusual interest, as they fell from flocculent, bulging, cirro-stratus clouds of this character.

In conclusion, it seems hardly necessary to add that the mechanism of rain formation and the phenomena connected therewith is of great interest and import, and should receive from scientists a larger measure of attention than hitherto.

It seems certain that systematic study of this and allied phenomena would, through the increase of our exact knowledge regarding it, richly repay patient and thoroughgoing investigation. Aerophiles, containing self-registering instruments, might, with advantage, be sent up into the clouds during various rainfalls, and the messages they would bring down would doubtless greatly increase our knowledge of the temperatures, humidity, electrical conditions, etc., of that mysterious cloudland realm, so rarely entered and of which we know so little. As yet we know not to a certainty the exact heights of the various rain-producing clouds or strata, or how far within the clouds above their bases precipitation first commences. Neither do we know the temperature or humidity within the various "lows" and "highs," or within thunder and storm clouds, nor the variations of these with corresponding altitudes within cloud-free regions outside storm areas. Our knowledge of the highest altitudes attained by the upper clouds within the various segments of general rainstorms is most unsatisfactory, and we know but little of the ultimate maximum altitudes to which water vapor ascends.

As Professor Abbe says, referring to recent balloon ascents in Europe, when heights of 10,000 to 20,000 meters were attained (MONTHLY WEATHER REVIEW, June, 1904, pp. 276–277):

> The air that descends in our areas of high pressure and that which flows out of the polar regions may come from the upper limits of the atmosphere, and with equal probability the air that ascends in our areas of low pressure may continue its journey upward to those same heights. * * * We at the bottom of the atmosphere are nearly as unconscious of the commotion above us as are the animals at the bottom of the ocean.

THE ADVANCEMENT OF METEOROLOGY.

By T. H. DAVIS.

In Prof. J. M. Pernter's letter, which appears in the May issue of the MONTHLY WEATHER REVIEW, there are two paragraphs that all sincere meteorologists should "read, mark, learn, and inwardly digest." Speaking on the discovery of the correct physical basis, he states:

> This basis will never be discovered by means of experiments in predictions, which are, for the most part, matters of personal judgment, but only *through long-continued, rigidly exact, genuine research*, with the aid of physical methods, by men equipped with a complete knowledge of physical, meteorological, and mathematical sciences.

Again he states:

> Work, hard and thorough work, for many years, and not a game of chance in experimental predictions, is what is required in this matter.

Scattered through the United States are a number of stations for the regular observations of meteorological phenomena. These are in charge of trained men, who regularly make observations of temperature, pressure, humidity, wind (direction and rate of travel), conditions of weather and so on, as directed by the Central Bureau in Washington. To these clever, educated men this work, speaking generally, must after a time become quite mechanical, and they must feel, after recording their observations, producing weather maps, and replying to numerous telephonic inquiries throughout the day, that those duties are all that is required of them, and really they should be, because they are more arduous than is generally supposed. For this reason it is only now and again, at long intervals, that we see any special investigation reported as having been made by any of the weather observers.

Now, all who are truly interested in meteorology possess an ardent desire to see it included in the realms of the exact sci-

ences, but it does not seem that it will make much progress thither so long as we are satisfied with "highs and lows" and supposed results which should mature from supposed absolute mathematical calculations. These latter are necessarily of the greatest possible value to the science, but it hardly seems that we shall arrive at a fundamental basis on these alone.

Hypotheses and theories whose nativity spring from deep mathematical calculation need much in the way of actual occurrence for their confirmation.

In meteorology we are dealing with a subject particularly profound and full of difficulties and easy snares. For example, consider the theories of cyclones and cyclone formation. Although these are considered to have been pretty well worked out, yet there seems to be no investigator who can state absolutely why cyclonic areas first appear on the western coast (mainly in the northwest), on the southern coast bounding the Gulf, or from the southeast. Neither can we find absolute facts which explain the varied paths of the western cyclones as they pass across our continent toward the Atlantic Ocean, nor have we any sure data for explaining their erratic rates of travel. All that seems to be attempted in this direction appears based on supposition and experience rather than on fixed and definite laws. The forecasters have certain rules on which to base their forecasts, but evidently these are not always justified by the facts. What, then, should be done to promote and maintain the dignity of meteorology as a science? Does it not seem that rigid research in other places than the Central Bureau is necessary?

It does seem that patient, qualified scientists, not necessarily civil servants by examination, devoted to the science, should be appointed in selected districts to make research into the meteorological phenomena and weather conditions for that specific locality, to record their results, and periodically make report of results as based on actual occurrences. These, passed on to the Central Bureau, could be further studied, and hypothetical reasoning would be proved or disproved by contact with the phenomena that have actually occurred as carefully observed over a period of time. Research, patient and faithful observation by independent men, as above outlined, would do very much in methods by which fundamental principles could be accurately established. Accident will never bring them, for the subject is too abstruse to admit of anything of the kind.

What ought to occur under certain conditions, and what does occur, are too often at variance, and it is for the maintenance of the conformity of these two conditions that devoted meteorologists should use all their energy and thought, together with true and faithful observation of actual facts.

THUNDERSTORMS AT TAMPA, FLA.

By JOSEPH BILY, JR., Assistant Observer.

Thunderstorms at Tampa, may be divided into two classes; those of the summer, which occur from May to September and are of great frequency, and those of the cooler months, which are distributed from October to April and are of but occasional occurrence. Storms of the former class are in nearly all cases of local origin, due to the convectional overturning of ascending air currents, but the thunderstorms of the winter type present a different character, and accompany cyclonic areas which drift eastward from Texas or the west Gulf of Mexico, and whose centers pass from 200 to 500 miles to the northwestward of Tampa.

During the summer months cyclonic disturbances are of rare occurrence in this region, being confined to northern latitudes. The cyclones of the West Indies, after recurving from their westerly course in West Indian waters, generally pass northward so far to the east as to give Tampa fair weather; or, when continuing on their westward drift and crossing the Gulf of Mexico, their centers are such a distance to the south and west of Tampa that only occasional showers are experienced. When the centers of these storms pass in proximity to Tampa heavy rains and high winds result. Thus we see that but for the frequent occurrence of local thunderstorms in the summer the sources of rain are limited. The geographical form and location of central and southern Florida, a peninsula surrounded by large bodies of water, admit of this pronounced summer type of climate. There is thus a daily interchange of air between land and sea, except when interrupted by movements of vast eddies in the atmosphere, known as areas of high and low pressure.

The summer thunderstorms are noticeably mild when compared with those of a continental climate. The thunder is not loud, but a copious rainfall is a characteristic that may always be observed. These conditions seem to be the reverse of those in the interior and northern portions of the United States, where but little rain accompanies a mild thunderstorm, the heavy or copious rainfall being a marked feature of the severe thunderstorms of those regions.

During the warm season of the year when weather conditions are dominated by a permanent area of high pressure off the south Atlantic coast, the prevailing winds over west-central Florida are from south to east. The nights, as a rule, are clear after 10 p. m., but with the rising of the sun in the morning the lower stratum of air becomes rapidly heated, causing ascending currents, and by 7 a. m. cumulus "rolls" are seen springing into life on the horizon. These white "ball-like" clouds increase in number and size during the forenoon, and become in the early afternoon closely packed masses, from the edges of which protrude miniature mountain peaks or overgrown cumulus clouds with evident augmentation or "bubbling over" at the summit. Up to the time of maximum cloudiness the atmosphere is sultry and oppressive, but with the breaking of the storm and the downpour of rain, attended by a gust of wind, the temperature falls several degrees, which, with the decrease in humidity, produces an interval of relief. After the storm the clouds break away to some extent; the sun comes out, evaporating the fallen rain; the temperature tends to rise to its normal, and again the atmosphere is as sultry and oppressive as before the storm. The sky continues partly cloudy till evening, when the clouds decrease and disappear in the early night, while the air becomes cool and comparatively refreshing.

These storms have their greatest frequency in the afternoon, but occur in the forenoon as well as early night. Their prevailing movement is from the eastern quadrant, with a secondary frequency from the southern quadrant. They have, however, been noticed to move from all points of the compass, and at times the storm appears to be stationary. Nor are they of great diameter. There have been several occurrences of heavy rain accompanying these "locals" over the southern section of the city while in the northern portion only a trace or no rain fell; and a reverse of these conditions has also been known, all depending on the location and direction of movement of the center of the storm. As many as four distinct and separate thunderstorms have been noticed at the same time.

During the past fourteen years, 1890–1903, there have been six days with three thunderstorms occurring at various portions of the same day, and forty-two days with two such occurrences, distributed as follows:

Thunderstorms.	May.	June.	July.	August.	September.
Three in one day	0	4	1	1	0
Two in one day	4	11	17	10	0

The damage caused by the storms of the summer type is light,

as compared with the damage by lightning in higher latitudes. The preference of the lightning is for telegraph poles, trolley wires, and trees, the houses destroyed being few.

With the approach of the cooler months there is an increase in the number and movement of areas of high and low pressure, and a tendency to move across the southern portion of the United States. It is to this class of low-pressure areas that move eastward from the west Gulf of Mexico that thunderstorms of the winter type owe their existence. Thunderstorms do not always occur in connection with these areas of low pressure, the exceptions being when they move north of northeast by way of the lower Mississippi Valley, or when the temperature is low, and when there has been considerable cloudiness preceding the rain area.

The thunderstorms of the winter type invariably move over Tampa and the vicinity from west to east, or southwest to northeast. Prior to the breaking of the storm the wind blows steadily from the southeast for some time, having shifted to that position from a southerly point, the atmosphere is very oppressive, the temperature is high, the sky, which had been partly covered with clouds of cirrus formation, becomes overcast with a dark stratus layer, while huge cumulo-nimbus clouds appear on the western horizon. After the clouding of the sky the southeast wind lightens, and for a short while there is almost a lull, which is followed by a strong gust from the northwest, and the storm breaks in earnest. The downpour of rain begins almost instantly with the change of wind, but is not quite so heavy as that which accompanies the "locals" of the summer type. These storms are more severe than those of the summer type, although of about the same average duration; the thunder is louder, the lightning more vivid, while the wind, which shifts to the northwest at the commencement of the storm, continues brisk for about an hour or so. Generally they are followed by cooler weather lasting a day or two, accompanying an area of high pressure which moves southeastward to the Gulf States in the rear of the cyclonic disturbances.

The occurrence of these storms is not confined to any portion of the day, but the greatest frequency is in the middle afternoon. Of this type of thunderstorms during the fourteen years, 1890–1903, there have been but four days with two such occurrences to their credit, distributed as follows:

Thunderstorms.	October.	November.	December.	January.	February.	March.	April.
Two in one day	0	0	0	1	0	2	1

The transition period from the winter to the summer type occurs during the month of April, when low-pressure areas from the west Gulf of Mexico become rare and the diurnal changes of weather assume their ascendancy. The south Atlantic area of high pressure now becomes the influencing factor.

To enable the ready recognition of thunderstorms as belonging to either of the two types, summer or winter, during the transition periods in the spring and autumn, a brief synopsis of the principal features of each type is given as follows:

SUMMER TYPE.	WINTER TYPE.
BAROMETER.	
Falls at a steady rate before storm, rises at outbreak of storm, and resumes its regular diurnal course after the passing of the storm.	Is low and falls up to the time of breaking of storm; then rises rapidly and continues to rise until the crest of the high-pressure area passes to the eastward.
TEMPERATURE.	
High before the storm; falls during storm, but rises afterwards and assumes its normal for rest of the day.	The maximum for the day occurs just before the storm; the temperature falls during the storm and is low afterwards.
HUMIDITY.	
Highest at outbreak of the storm; decreases during the storm, but increases to some extent after the storm.	Highest at outbreak of the storm; decreases during the storm and is low after the storm.
PRECIPITATION.	
Rain falls in heavy showers, though generally there is a steady downpour; the ending is abrupt.	Rain falls heavily during first half hour or hour of a thunderstorm, then becomes light, and usually ends before last thunder.
WIND.	
Easterly before the storm; shifts to fresh or brisk southwest or west at breaking of storm, decreasing in force shortly afterwards.	Steady southeast before the storm; shifts to brisk northwest at outbreak of storm; is fresh toward end of and after the storm.

TABLE 1.—*Number of days with thunderstorms at Tampa.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.	Departure from the normal.
1890				0	0	6	6	5	4	1	0	0		
1891	0	0	0	4	0	2	2	11	1	0	0	0	20	−36
1892	0	0	0	0	7	1	10	16	7	0	0	0	41	−15
1893	2	3	4	4	6	18	14	5	4	1	2	1	64	+ 8
1894	1	1	2	2	8	13	7	6	5	0	0	1	46	−10
1895	1	0	2	4	6	5	9	17	3	0	0	0	46	−10
1896	2	1	2	2	3	7	11	13	4	0	0	0	45	−11
1897	0	1	1	5	1	11	10	12	4	1	0	0	46	−10
1898	0	2	0	0	1	13	8	16	5	1	0	1	47	− 9
1899	2	4	1	3	3	17	11	12	12	2	0	0	67	+11
1900	1	2	3	5	5	15	22	22	5	3	1	1	85	+29
1901	1	2	4	3	6	15	20	24	3	1	0	0	79	+23
1902	0	3	3	2	9	6	13	15	13	3	0	1	68	+12
1903	4	1	8	3	7	15	26	22	8	0	2	1	97	+41
1904	3	3	9											
Average	1	2	3	3	4	10	12	14	6	1	0.4	0.4	*56	
Greatest	4	4	9	5	9	18	26	24	13	3	2	1	97	−36
Least	0	0	0	0	0	1	2	5	1	0	0	0	20	+ 8

*Average for the entire period.

Table 1, containing the monthly and annual number of days with thunderstorms for fourteen years, April, 1890, to March, 1904, shows that the average annual number of such days is fifty-six. In 1891 there was an average of one day with a thunderstorm in every eighteen days, while in 1903 the average was one such day in every four days; the average for the fourteen years is an occurrence of one day with a thunderstorm in every seven days, or one each week.

Table 2 gives the number of thunderstorms for each month and year for fourteen years from April, 1890, to March, 1904. Here we have an average of 60 thunderstorms for the year, or one to every six days, while the average annual number of days with thunderstorms is fifty-six, making a general average of fifteen thunderstorms to every fourteen days with thunderstorms, or an occurrence of two thunderstorms on one day of every fourteen thunderstorm days. The greatest annual number was 122 in 1903, an average of one thunderstorm to every three days; the least was twenty in 1891, an average of one thunderstorm to every eighteen days. The greatest monthly average is fifteen for August; the least is 0.4 for November and December. The greatest number of thunderstorms in any month was 38 in July, 1903, these occurring in twenty-six days.

TABLE 2.—*Number of thunderstorms at Tampa.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.	Departure from the normal.
1890	.....	.....	.....	0	0	6	6	5	4	1	0	0	.....	.....
1891	0	0	0	4	0	2	2	11	1	0	0	0	20	−40
1892	0	0	0	0	7	1	10	16	7	0	0	0	41	−19
1893	2	3	4	4	6	22	15	5	4	1	2	1	69	+ 9
1894	1	1	2	2	8	13	8	6	5	0	0	1	47	−13
1895	1	0	2	4	5	4	11	20	3	0	0	0	50	−10
1896	2	1	2	2	3	7	11	13	4	0	0	0	45	−15
1897	0	1	1	4	1	11	10	14	4	1	0	0	47	−13
1898	0	2	0	0	1	14	8	15	5	1	0	1	47	−13
1899	2	4	1	3	3	19	12	13	11	2	0	0	70	+10
1900	1	2	3	6	5	16	23	22	5	3	1	1	88	+28
1901	1	2	4	2	7	15	20	25	3	1	0	0	80	+20
1902	0	3	3	2	9	6	14	19	13	3	0	1	73	+13
1903	4	1	8	3	9	25	38	23	8	0	2	1	122	+62
1904	4	3	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Average	1	2	3	3	5	12	13	15	6	1	0.4	0.4	*60	.....
Greatest	4	4	10	6	9	25	38	23	13	3	2	1	122	+62
Least	0	0	0	0	0	1	2	5	1	0	0	0	20	+ 9

*Average for the entire period.

The maximum period of successive days with thunderstorms, for each month and year, from April, 1890, to March, 1904, is given in Table 3. The longest period is seventeen days in 1903, from June 29 to July 15, inclusive; the shortest maximum period of any one year, three days, occurred in 1897.

The longest maximum period of any one month was fifteen days in July, 1903, from the 1st to the 15th, inclusive.

TABLE 3.—*Greatest number of consecutive days with thunderstorms at Tampa.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	.....	.....	.....	0	0	3	2	2	1	1	0	0	.....
1891	0	0	0	4	0	2	1	4	1	0	0	0	4
1892	0	0	0	0	3	1	7	4	4	0	0	0	8
1893	2	2	1	2	3	9	6	3	2	1	1	1	9
1894	1	1	1	1	2	7	1	2	1	0	0	1	8
1895	1	0	1	1	2	2	3	6	1	0	0	0	6
1896	2	1	1	2	2	2	3	5	1	0	0	0	5
1897	0	1	1	2	1	3	3	3	1	1	0	0	3
1898	0	2	0	0	1	4	2	5	2	1	0	1	5
1899	1	2	1	1	1	6	3	3	5	1	0	0	6
1900	1	1	1	4	2	6	8	9	2	2	1	1	9
1901	1	1	1	2	3	4	7	8	1	1	0	0	8
1902	0	1	2	1	3	2	3	4	7	1	0	1	7
1903	1	1	5	1	2	6	15	10	2	0	1	1	17
1904	1	2	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Greatest	2	2	5	4	3	9	15	10	5	2	1	1	17

TABLE 4.—*Average duration of thunderstorms (hours and minutes).*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890	.....	.....	.....	0	0	2 34	3 31	3 05	2 43	4 00	.....	0	3 20
1891	0	0	0	3 45	0	2 10	1 28	1 38	1 17	0	0	0	1 58
1892	0	0	0	0	1 10	0 42	1 26	1 58	1 26	0	0	0	1 29
1893	1 50	1 00	3 30	1 23	2 07	1 43	0 57	1 22	1 56	.....	0 45	4 27	2 04
1894	0 49	0 30	0 55	1 48	1 46	2 12	3 00	2 04	2 35	0	0	1 03	1 58
1895	.....	0	4 26	3 18	2 41	2 18	2 12	1 35	1 48	0	0	0	3 03
1896	2 52	1 35	1 44	0 34	1 04	2 57	1 32	1 50	1 41	0	0	0	1 47
1897	0	3 45	1 35	2 55	2 05	1 44	2 26	1 26	1 06	3 25	0	0	2 19
1898	0	1 10	0	0	0 40	2 01	2 26	2 13	1 45	1 25	0	.....	1 42
1899	0 48	1 20	0 30	2 13	1 18	2 05	1 36	1 41	2 08	0 41	0	0	1 28
1900	3 08	1 25	5 25	1 36	1 32	1 53	2 11	2 42	0 40	1 38	0 25	1 27	2 08
1901	0 05	1 55	1 51	3 49	1 30	1 48	2 13	1 29	1 13	0 20	0	0	1 40
1902	0	3 15	1 28	0 58	2 10	2 28	3 14	1 22	2 32	1 17	0	4 00	2 16
1903	0 36	0 05	1 30	1 15	1 04	1 36	1 19	1 50	1 00	0	1 39	0 10	1 13
1904	1 19	0 52	1 26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Av'rage	1 20	1 33	1 56	2 28	1 38	1 57	1 58	1 50	1 48	1 36	1 03	2 13	1 54
Gr'test.	3 08	3 45	5 25	3 49	2 41	2 57	3 31	3 05	2 43	4 00	1 39	4 27	3 20
Least	0 05	0 05	0 30	0 34	0 40	0 42	0 57	1 22	0 40	0 20	0 25	0 10	1 13

Table 4 gives the mean duration of thunderstorms for each month and year from April, 1890, to March, 1904. At the foot of the table are given the average duration, for each month and for the year, during fourteen years, and also the greatest and least mean monthly and mean annual durations. The time of duration considered in this table is the interval between the first and last thunder of a thunderstorm. The average duration of all thunderstorms for the entire period is 1h 54m. The greatest monthly average duration is 2h 28m in April the least is 1h 03m in November. The greatest mean duration of any one month was 5h 25m in March, 1900; the least was 0h 5m in January, 1901, and February, 1903. The longest duration of any thunderstorm was 10h 57m on June 10, 1900; the shortest duration was only one peal on several occasions. The period of time during which thunder has been heard at Tampa from 1890 to 1903 is as follows:

Year.	Duration.	Year.	Duration.	Year.	Duration.
	Hrs. mins.		*Hrs. mins.*		*Hrs. mins.*
1890	70 02	1895	130 50	1900	181 52
1891	41 20	1896	78 45	1901	120 00
1892	54 40	1897	106 32	1902	165 28
1893	132 15	1898	78 20	1903	146 24
1894	78 20	1899	99 10		

TABLE 5.—*Daily frequency of thunderstorms at Tampa (April, 1890, to March, 1904).*

Day of month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1	0	0	3	1	2	6	8	5	5	0	1	0	.....
2	0	0	2	1	2	5	5	5	5	1	0	0	.....
3	0	0	0	0	2	5	7	5	4	1	0	0	.....
4	0	1	1	0	2	2	4	7	8	2	1	2	.....
5	0	1	0	0	1	6	5	8	5	0	0	0	.....
6	0	0	1	1	3	4	6	9	3	0	1	0	.....
7	0	0	1	1	1	5	6	8	6	0	0	0	.....
8	0	0	1	0	2	6	7	6	5	0	0	0	.....
9	0	0	1	2	5	7	5	6	2	1	0	0	.....
10	2	0	1	0	1	7	6	9	1	1	0	0	.....
11	0	0	1	1	2	4	6	6	3	1	0	1	.....
12	1	3	1	1	2	2	4	5	3	0	0	0	.....
13	0	2	1	1	2	5	6	10	4	0	0	0	.....
14	0	0	2	2	1	2	5	4	4	2	0	0	.....
15	0	1	1	2	1	3	5	5	1	0	0	0	.....
16	0	0	1	1	4	2	7	7	4	0	0	1	.....
17	2	0	1	2	1	4	6	6	2	1	0	0	.....
18	0	2	0	2	0	4	5	6	3	1	0	0	.....
19	0	3	3	3	1	4	6	3	2	0	0	0	.....
20	0	1	5	2	4	3	7	7	2	0	0	0	.....
21	1	1	2	1	2	4	9	7	1	1	0	0	.....
22	1	1	2	1	3	5	3	6	0	0	0	0	.....
23	3	1	1	0	1	7	2	5	0	1	1	2	.....
24	0	1	0	1	3	5	3	6	0	0	0	0	.....
25	0	1	2	2	2	4	6	4	1	0	0	0	.....
26	1	1	4	3	2	5	5	6	1	0	0	0	.....
27	0	0	1	1	2	6	4	7	2	0	1	0	.....
28	2	3	0	2	0	6	5	7	1	0	0	0	.....
29	2	.....	0	2	1	8	5	6	0	0	0	0	.....
30	1	.....	0	1	2	8	6	8	0	0	0	0	.....
31	1	.....	0	.....	3	.....	5	7	.....	0	.....	0	.....
Sums	17	23	39	37	60	144	169	196	78	13	5	6	787
Average	1	2	3	3	4	10	12	14	6	1	0.4	0.4	56
Percentage	2	3	5	5	8	18	21	25	10	2	0.6	0.8	100

Table 5, showing the daily frequency of thunderstorms, gives the number of thunderstorm days for each day of the year during a period of fourteen years. The total number of days with thunderstorms during the fourteen years was 787. Of this number August has a frequency of 196 days, or 25 per cent of the total number of days with thunderstorms. The least frequency is in November, the percentage of the annual number being but 0.6. August 13 has the greatest frequency of any day in the year, thunderstorms having occurred on ten such days out of a possible fourteen, a frequency of 71 per cent.

Tables 6 and 7 present the hourly occurrences of thunderstorms and are based on the time of beginning, without regard to the duration of the storm. Table 6 exhibits the distribution of thunderstorms during each hour of the day, local time, or hourly frequency, while Table 7 gives the percentage of hourly occurrences of thunderstorms for the month and year. The greatest hourly frequency of occurrences for the fourteen years is between 3 p. m. and 4 p. m. during which hour 98 thunderstorms had their beginning; the hours 12

noon to 1 p. m. and 2 p. m. to 3 p. m. are next with a frequency of 95, and the hour 1 p. m. to 2 p. m. follows with a frequency of 93. Thus we see that the greatest frequency of thunderstorms is during the early afternoon hours. The least likelihood, or frequency, of occurrence of thunderstorms is during the hour 11 p. m. to 12 midnight, only one such occurrence being recorded during the fourteen years, and that taking place on June 21, 1897.

TABLE 6.—*Hourly frequency of thunderstorms at Tampa (April, 1890, to March, 1904), local time.*

Hour.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sums.
12 mid. to 1 a. m.	....	1	1	....	....	....	....	....	....	....	....	....	2
1 a. m. to 2 a. m.	1	....	1	2	....	....	....	1	....	1	....	....	6
2 a. m. to 3 a. m.	....	....	....	....	....	....	....	1	....	1	....	....	2
3 a. m. to 4 a. m.	....	2	....	....	....	....	....	1	....	1	....	....	4
4 a. m. to 5 a. m.	1	1	2	....	2	1	....	1	....	....	....	....	8
5 a. m. to 6 a. m.	....	1	1	2	....	....	3	1	....	....	....	....	8
6 a. m. to 7 a. m.	1	....	1	1	1	....	1	2	2	....	....	....	9
7 a. m. to 8 a. m.	....	1	....	1	1	3	3	4	1	....	....	....	14
8 a. m. to 9 a. m.	1	....	2	2	3	2	2	6	3	....	1	....	22
9 a. m. to 10 a. m.	....	....	1	1	1	1	4	3	1	....	....	1	13
10 a. m. to 11 a. m.	....	....	1	1	2	8	9	12	1	....	1	1	36
11 a. m. to 12 noon	2	2	3	2	2	8	13	18	2	1	....	....	53
12 noon to 1 p. m.	....	....	3	3	6	15	24	31	10	1	1	1	95
1 p. m. to 2 p. m.	1	1	2	2	8	15	30	19	13	1	1	....	93
2 p. m. to 3 p. m.	2	3	3	3	6	13	24	22	17	2	....	....	95
3 p. m. to 4 p. m.	2	2	3	5	4	25	24	25	5	3	....	....	98
4 p. m. to 5 p. m.	1	3	2	3	8	15	19	16	9	....	....	2	78
5 p. m. to 6 p. m.	....	2	3	....	5	12	8	13	4	....	1	....	48
6 p. m. to 7 p. m.	3	1	4	4	3	14	5	14	4	1	....	....	53
7 p. m. to 8 p. m.	1	....	....	1	6	8	2	3	2	....	....	....	23
8 p. m. to 9 p. m.	1	....	2	2	1	4	4	5	2	....	....	....	21
9 p. m. to 10 p. m.	....	2	....	....	....	4	....	3	....	....	....	....	9
10 p. m. to 11 p. m.	....	1	1	....	1	1	1	....	1	....	....	....	6
11 p. m. to 12 mid.	....	....	....	....	....	1	....	....	....	....	....	....	1
Sums	17	23	36	35	60	150	176	201	77	12	5	5	*797
Greatest hourly frequency	3	3	4	5	8	25	30	31	17	3	1	2	98
Hour of greatest frequency, p. m.	6–7 4–5	2–3	6–7	3–4	1–2 4–5	3–4	1–2	†12 –1	2–3	3–4	†12 –2	4–5	3–4

*Excluding 41 thunderstorms indeterminable as to time. †Noon.

TABLE 7.—*Hourly percentage of thunderstorms (April, 1890, to March, 1904), local time.*

Hour.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
12 mid. to 1 a. m.	....	4	3	....	....	....	....	....	....	....	....	....	0.3
1 a. m. to 2 a. m.	6	....	3	6	....	....	....	0.5	....	8	....	....	0.8
2 a. m. to 3 a. m.	....	....	....	....	....	....	....	0.5	....	8	....	....	0.3
3 a. m. to 4 a. m.	....	9	....	....	....	....	....	0.5	....	8	....	....	0.5
4 a. m. to 5 a. m.	6	4	6	....	3	1	....	0.5	....	....	....	....	1.0
5 a. m. to 6 a. m.	....	4	3	6	....	....	2	0.5	....	....	....	....	1.0
6 a. m. to 7 a. m.	6	....	3	3	2	....	1	1.0	3	....	....	....	1.0
7 a. m. to 8 a. m.	....	4	....	3	2	2	2	2.0	1	....	....	....	2.0
8 a. m. to 9 a. m.	6	....	6	6	5	1	1	3.0	4	....	20	....	3.0
9 a. m. to 10 a. m.	....	....	3	3	2	1	2	1.0	1	....	....	20	2.0
10 a. m. to 11 a. m.	....	....	3	3	3	5	5	6.0	1	....	20	20	5.0
11 a. m. to 12 noon	12	9	8	6	3	5	7	9.0	3	8	....	....	7.0
12 noon to 1 p. m.	....	....	8	9	10	10	14	15.0	13	8	20	20	12.0
1 p. m. to 2 p. m.	6	4	6	6	13	10	17	9.0	17	8	20	....	12.0
2 p. m. to 3 p. m.	12	13	8	9	10	9	14	11.0	22	17	....	....	12.0
3 p. m. to 4 p. m.	12	9	8	14	7	17	14	12.0	6	25	....	....	12.0
4 p. m. to 5 p. m.	6	13	6	9	13	10	11	8.0	12	....	....	40	10.0
5 p. m. to 6 p. m.	....	9	8	....	8	8	5	6.0	5	....	20	....	5.0
6 p. m. to 7 p. m.	18	4	11	11	3	9	3	7.0	5	8	....	....	7.0
7 p. m. to 8 p. m.	6	....	....	3	10	5	1	1.0	3	....	....	....	3.0
8 p. m. to 9 p. m.	6	....	6	6	2	3	2	2.0	3	....	....	....	3.0
9 p. m. to 10 p. m.	....	9	....	....	....	3	....	1.0	....	....	....	....	1.0
10 p. m. to 11 p. m.	....	2	3	....	2	1	1	.....	1	....	....	....	0.8
11 p. m. to 12 mid.	....	....	....	....	....	1	....	.....	....	....	....	....	0.1
Greatest hourly percentage.	18	13	11	14	13	17	17	15.0	22	25	20	40	12.0

The greatest hourly percentage of occurrence for the year is twelve, and is for each of the hours from 12 noon to 4 p. m.; the least is 0.1 for the hour 11 p. m. to midnight. The hour of greatest percentage of occurrences varies for the months, but is confined to the afternoon, the range lying between 12 noon and 7 p. m. From January to March the hour of greatest percentage of occurrences is in the evening. It then moves toward the middle of the day with approach of the summer months, the hour being 12 noon to 1 p. m. in August, when it recedes to the late afternoon as winter comes on. The hours of greatest frequency of occurrence are given at the base of Table 6.

TABLE 8.—*Monthly and annual precipitation, inches and hundredths.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1890...	.....	.....	.....	0.55	4.49	11.58	11.91	8.87	9.24	5.05	3.31	1.32	.....
1891...	1.95	0.98	3.24	2.77	0.69	7.12	4.52	9.48	7.96	2.61	1.99	1.15	44.46
1892...	3.25	1.13	1.58	0.31	3.03	12.41	3.94	8.60	6.67	1.34	1.28	3.12	46.66
1893...	2.36	1.71	6.57	1.34	2.67	10.89	2.11	8.56	6.24	2.46	2.73	1.32	48.96
1894...	1.42	2.73	1.71	1.36	6.92	9.15	11.56	7.16	17.28	4.84	2.26	0.54	66.93
1895...	3.40	3.99	2.07	5.38	1.29	4.24	10.63	8.88	4.80	3.04	1.78	1.14	50.64
1896...	3.38	3.77	2.16	0.86	2.27	13.42	12.30	7.96	7.30	1.00	3.96	1.25	59.63
1897...	1.42	5.40	1.44	4.65	0.33	8.46	6.23	7.84	10.73	4.78	0.63	2.50	54.41
1898...	0.42	1.52	0.08	0.16	0.37	5.96	8.29	17.83	6.57	4.50	1.96	2.87	50.53
1899...	6.45	6.27	1.40	3.39	0.48	12.18	15.53	4.93	8.35	2.42	0.24	2.18	63.82
1900...	4.36	4.15	7.36	3.74	2.33	7.88	4.40	6.90	4.86	5.11	0.96	3.40	55.45
1901...	1.15	1.76	3.58	1.63	4.31	7.52	6.82	8.03	5.18	0.36	0.48	1.24	42.06
1902...	0.28	5.72	1.91	1.07	4.11	6.43	7.64	7.35	10.14	3.37	0.97	1.39	50.38
1903...	6.35	6.06	4.79	0.74	1.92	5.38	9.34	6.60	10.64	0.93	3.09	1.46	56.68
1904...	6.73	3.20	0.77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Av'ge.	3.06	3.46	2.76	2.00	2.52	8.76	8.23	8.46	8.28	2.99	1.83	1.78	*54.12
Gr'test	6.73	6.27	7.36	5.38	6.92	13.42	15.53	17.83	17.28	5.11	3.96	3.40	66.93
Least	0.28	0.98	0.08	0.16	0.33	4.24	2.11	4.93	4.80	0.36	0.24	0.54	42.06

*Average for the entire period.

It must be admitted that thunderstorms and precipitation bear a close relation to one another, since it is seldom that a thunderstorm will occur without a copious fall of rain, or at least a trace over some portion of the region traversed by the storm. The effect of thunderstorms upon the rainfall distribution for the year at Tampa is well marked during the summer months, from the last decade in May to the first decade in October, inclusive; this period is termed the rainy season. With the increase in number of thunderstorms the monthly average rainfall advances from 2.52 inches in May to 8.76 inches in June, and remains above 8.00 inches throughout the following three months, when it decreases to 2.99 inches in October. The least monthly average is 1.78 inches in December. The rainfall increases during the months of January and February, when cyclonic areas from the west are at their maximum frequency, and then decreases to its secondary minimum monthly average of 2.00 inches in April. Table 8 gives the monthly and annual precipitation during the fourteen years, April, 1890–March, 1904, and the average for the month and

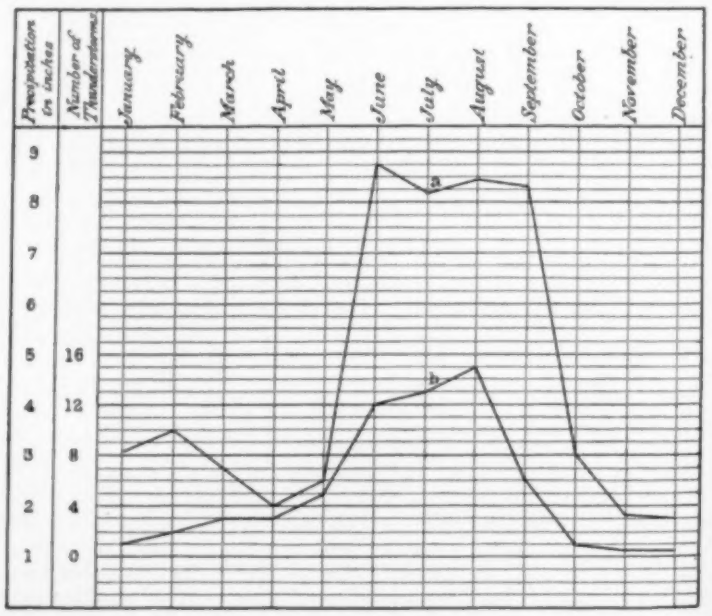

FIG. 1.—Average monthly precipitation and number of thunderstorms for fourteen years, April, 1890–March, 1904. a. Average monthly rainfall. b. Average monthly number of thunderstorms.

year. Fig. 1 shows the relation between the average monthly rainfall and the average monthly number of thunderstorms.[1]

AN INDEX OF METEOROLOGICAL ITEMS IN THE JESUIT RELATIONS.

By Rev. F. L. ODENBACH, S. J.

("The Jesuit Relations and Allied Documents," Burrows Brothers, Cleveland, Ohio, is a reprint, in about 73 volumes, of the accounts by the French Jesuit missionaries of their travels and explorations in Canada and the Northern and Northwestern States of the United States, from 1610 to 1791. The reprint includes both the original narrations and an English translation thereof. From the exhaustive general index Father Odenbach has culled all entries relating to the weather or meteorological phenomena.—*F. O. S.*)

The number of the volume is printed in heavy-face type; the number of the page in light face.

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[1] Such graphical representations have obvious advantages, but they are likely to be misleading to the student unless he is careful to find out in each case just how much the diagram includes and what it omits. The present diagram, for example, is based on monthly averages. We can not select a point midway between two months and say that this represents conditions on the 15th of the month, or on any other definite dates The only points on these curves that have any significance are those that fall on the vertical lines. The intervening portions of the curve serve to guide the eye, and to indicate the correspondence between the change. in the two elements considered.—*F. O. S.*

RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. KIMBALL, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

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MOUNT TSUKUBA METEOROLOGICAL OBSERVATORY. WHAT DOES METEOROLOGY NEED FOR ITS FUTURE ADVANCEMENT?

By S. TETSU TAMURA, Department of International Research in Terrestrial Magnetism of the Carnegie Institution, Washington, D. C.[1]

Since the time of Pascal it appears to have been recognized that the exploration of the upper strata of the atmosphere is one of the most important investigations for the advancement of cosmical physics. So long as this vast mysterious ocean of atmosphere remains unexplored, modern meteorology must remain at a standstill; for the meteorological phenomena at the earth's surface depend, in great measure, upon the thermal and electrical as well as the dynamic condition of the whole atmosphere. Hence, many balloon ascents and kite experiments have been undertaken and a number of mountain observatories have been established in Europe and elsewhere.

In Japan, too, the importance of the meteorological survey of the upper atmosphere was recognized soon after the organization of our meteorological service in 1875. Since that time specialists at the Central Meteorological Observatory of Tokio, and also at provincial stations, have undertaken many meteorological expeditions to high mountains in order to investigate the phenomena of the higher strata of the atmosphere. For instance, to Mount Fuji (3720 meters) in every summer since 1889; to Mount Gozaishodake (1200 meters) in the summer of 1888; to Mount Ontake (3060 meters) in 1891; to Mount Ishizuchi (1980 meters) in 1894; and to several other mountains whose heights range from 3000 to 740 meters. But these expeditions were usually undertaken in the warmest season of the year, since any long stay on the summit was impracticable in winter. For the establishment of our first Japanese mountain observatory, we are indebted to our illustrious Prince Yamashina. For the site of his observatory His Imperial Highness has chosen Mount Tsukuba, that remarkable mountain of Japan which stands lonely on an extensive plain, isolated from all mountain ranges, and which, moreover, lies on the tracks of the cyclones of a very intense character.

Mount Tsukuba is on the eastern coast of Japan, 40 miles north-northeast of Tokio. The mountain is quite conical in shape and its summit is divided into two peaks, the East Peak and the West Peak, which are one-half mile apart, the west peak being the higher. Though only 2925 feet, or 870 meters, in height, Mount Tsukuba has a commanding view over Musashino, the most extended plain in Japan. And grand, indeed, is the view from the top of this mountain. The city of Tokio and other innumerable towns are dimly visible. Hundreds of miles distant, the snow-capped summit of Mount Fuji, the volcanic peak of the Asama, and the holy mountains of Nikko form a striking panorama. To the south nothing may be seen, except the vast surface of the Pacific Ocean and the infinite space. Mount Tsukuba is covered with pines and cryptomerias, and its summits are dotted with shrines and legendary antiquities, the largest shrine of which is sacred to Izanagi and Izanami, the first god and goddess of the mythological Japan. The legend is that Izanagi and Izanami constructed this mountain as a bulwark against the waves of the Pacific Ocean, which they had forced to retire to the other side of Kashima, formerly an island in the sea. This tradition is in accordance with the fact, recently verified by our geologists, that the east coast of Japan has been gradually rising during many centuries.

[1] The author was formerly fellow in mathematical physics at Columbia University, under Prof. R. S. Woodward, and at Clark University, under Prof. A. G. Webster.

Amidst such legendary shrines and poetic regions, on the very top of the west peak, our prince-scientist established his meteorological observatory in 1901, and, with its companion base stations, it has been open for work since the first of January in 1902. The geographical coordinates of the observatory are

$\varphi = 36° 13'$ N.
$\lambda = 140° 06'$ E.
$H = 870$ meters above sea level.

The main building of the observatory is built of massive wood on a huge stone foundation and is covered with zinc plates as a protection against moisture. This building contains an instrument room, workshop, office, parlor, and rooms for the staff. The observatory is perfectly equipped with meteorological and seismological instruments of the latest design.

A few yards north of the building stands an iron tower (11.6 meters high), on the top of which an anemometer rests, or rather, is set in motion. Prince Yamashina's self-registering anemoscope, Robinson's anemometer, Jordan's sunshine recorder, and also Richard's anemograph for the registration of the vertical component of the wind have been installed upon the upper platform of the tower. West of the building stands a thermometer shelter, in which thermometers, psychrometers, with Assmann's ventilation arrangement, a hair-hygrograph, and a thermograph of large model are placed. Under this shelter ten earth thermometers, with perfect arrangement, are buried at different depths below the earth's surface, that is, to the depths of one-half and one decimeter for the measurement of the surface temperature, and to the depths of one-half, one and one-fifth, and two meters for the measurement of underground temperatures. On the roof of the main building may be found a lightning rod, wind vane, self-registering rain gage, an ordinary rain gage, and an anemometer. The instrument room is elegantly equipped with meteorological instruments, the most noteworthy of which are Richard's barograph of large model, self-recording pluviometers, amemometers, and a mercury barometer (so-called mountain barometer). These instruments are put on stone piers.

It is worthy of special mention that macro and micro-seismographs have been installed on a granite pier, which is founded upon a gigantic rock. One of them is the famous horizontal pendulum seismograph, devised by Prof. F. Omori, the illustrious seismologist in Japan. All seismographs, including Gray's conical pendulum instrument, and Ewing's horizontal pendulum seismograph, record ordinary or strong earthquake motion, but fail to give reliable records of very small and slow motions of pulsatory oscillations. Professor Omori has adopted the conical pendulum and constructed the seismograph that is capable of giving the records, not only of ordinary earthquakes, but of very small or slow movements of the earth accompanying earthquakes or due to distant earthquakes, of small pulsatory oscillations, and of slow changes of level.

In the International Seismological Congress, which was held at Strassburg in 1901, Professor Omori pointed out the importance of seismological observations on high mountains. While no other country or observatory has as yet undertaken seismological observations on a mountain as high as Mount Tsukuba, Prince Yamashina has equipped his observatory so perfectly with seismological instruments. Since their installation, many seismic phenomena of curious character have been observed, the most extraordinary of which were the slow horizontal movements of the earth's crust in January of 1902. The horizontal motion of a micro-seismic nature that was east-west wise began on the 4th of that month at 11:09 p. m. and lasted until the next day. Again motion of the same nature began on the 12th and lasted until the 15th. The seismograms of January 12–15 show that these movements began

almost at the same hour on each day and also ceased at the same hour, and that the curves are of the same character. When these phenomena were recorded on Mount Tsukuba nothing was observed at ordinary levels.

As companions to this observatory, two base stations were established by His Highness. The first base station is situated at the foot of the mountain, at the height of 36 meters above sea level. The second was built on the east side of the mountain, at the height of 240 meters. Important meteorological elements are here observed directly three times daily, and are also registered automatically. The personnel of the observatory at present consists of six or seven observers and computers. As the positions of director and meteorologist have not yet been filled, the observatory is under the temporary charge of my friend, Dr. T. Okada, who is an assistant meteorologist of the Central Meteorological Observatory at Tokio, and who is one of the ablest among young scientists in Japan.

The establishment of Mount Tsukuba Observatory by Prince Yamashina is certainly the initiation of the actual exploration of the upper atmosphere in Japan, and there can be no doubt that from this generosity of His Highness an important contribution to cosmical physics in general will eventually result. The topography of the mountain is a priori ideal for the study of meteorology, and, as before mentioned, it is so situated in our Island Empire that well-developed cyclones visit it frequently. The observatory will therefore be of great service in the study of atmospheric motions as well as in researches in the physics of the atmosphere.

It is, however, evident that the meteorological data for the upper atmosphere obtained at the mountain stations are more or less affected by the local topography and the disturbing elements of the mountain masses. During the scientific balloon ascents from Munich some years ago the neighboring mountain stations of Hohenpeissenberg, Hirschberg, and Wendelstein made simultaneous observations on many separate occasions. A discussion of all these data showed that, in general, temperatures obtained at mountain stations did not harmonize with the temperature of the free air as obtained by balloons. Hence, some scientists conclude that mountain stations are not fitted to give all the data required of them, and thus discourage the establishment of permanent mountain observatories. Of course, mountain observations must in many cases be supplemented by balloon and kite records; but the relative advantages of these methods of observations have not yet been determined. Many meteorological or cosmical elements need very delicate measurements and can not be accurately determined by balloon and kite observations. Moreover, is it impossible to determine the disturbing effect of mountain masses and thus to eliminate it from daily observations? There can be little doubt that the future advances in meteorology and in its allied subjects will be due in a great measure to the cooperations of mountain observations with balloon and kite work. Mountain observatories should be well equipped for balloon ascensions and kite explorations. Kiteflying from mountain tops deserves mention apart. As there are strong winds in the upper regions of the atmosphere, this method of investigation at mountain observatories promises to be as important as it is comparatively simple and inexpensive. Thus the mountain observations must be checked by observations taken in free air.

The scientific problems to be investigated at such a research observatory are manifold. The study of vertical temperature gradients and temperature inversions, and of thermal conditions in cyclones and anticyclones; researches on the distribution and condensation of moisture, the increase of rainfall with elevation, and the determination of the velocity of the wind and the distribution of pressure in the upper regions of the atmosphere: these are of paramount importance to meteorology. Mountain observatories also afford good opportunities for researches on the thermal radiation and conduction of the atmosphere and the earth's surface. The determination of constants for these thermal processes would no doubt be a great contribution to the advancement of meteorology. The principal problems to be investigated in the field of atmospheric electricity are the determination of the intensity of the earth's electric field and of the conductivity of the atmosphere for electricity, and the investigation of earth currents and the relation between atmospheric electricity and terrestrial magnetism. It will be of great interest to investigate the behavior of ions in the atmosphere and the variation with height of the constitution of air as regards positive and negative ions. The clearness of the sky and the purity of the atmosphere on mountains afford unusual opportunities for astrophysical research. Among those directly affecting meteorological work are observations on solar radiation and the determination of atmospheric absorption of heat. Mountain observatories must not neglect seismological researches.

Along these lines of research much work has been done in mountain observatories, as well as by balloon ascensions and kite experiments. The balloon ascents to heights of 23,000 to 30,000 feet, of Gay Lussac and Biot in 1804, of Barral and Bixio in 1850, of Glaisher in 1862, and of Berson in 1894, have furnished many important facts to the physics of the atmosphere. Recently free balloons carrying only self-registering apparatus have been brought to great perfection, and an extreme height of eleven miles has been reached. By this mode of research Hermite, Besançon, and Teisserenc de Bort in France, and Assmann, Berson, and Hergesell, in Germany, have done a great service to meteorology. Since October, 1902, daily balloon ascensions have been made by Assmann and his associates at the Aeronautical Observatory.

While European scientists have been thus occupied in the exploration of the upper atmosphere, American men of science have undertaken atmospheric researches by kiteflying. The kite experiments in atmospheric electricity by Benjamin Franklin and Joseph Henry are now classic. The repetition of Franklin's experiment with Mascart's electrometer was made by Alexander G. McAdie at Blue Hill Observatory in 1885, while L. Weber, of Breslau, was making a more extensive use of kites to collect atmospheric electricity. In 1895 the United States Weather Bureau decided to equip with kites a number of stations distributed over the United States, and, by daily ascensions, to make the most complete survey of the free upper atmosphere.

Preliminary experiments were undertaken by Professors Abbe and Marvin in order to bring the whole kite apparatus to the necessary state of efficiency. Professor Marvin devised a meteorograph for kite experiment, which is now known as the Marvin kite meteorograph, and also introduced many improvements. While the Weather Bureau was conducting this work, kiteflying was begun at the Blue Hill Observatory, under the direction of Mr. A. L. Rotch, and important contributions to dynamic meteorology have been made by this observatory.

The valuable services of mountain observatories and mountain observers must not, however, be forgotten. It is well known that the famous Humboldt, during his travels in the elevated regions of the New World, made an immense number of observations, which have much more than historic interest. Prof. J. Hann, using extensively and judiciously data obtained at the Sonnblick Observatory and its surrounding stations, has rendered a great service to meteorology by his researches in regard to the much discussed observations made at mountain observatories during the passage of cyclones and anticyclones. Professor Langley's determination of the solar constant, made at Mount Whitney during his famous expedition of 1881, is an important contribution to meteorology as well as to solar physics, and is another example of the advantages of mountain

observatories. Exner's researches on atmospheric electricity at the Sonnblick Observatory are also important.

Yet, with all these observational achievements, it must be confessed that the present status of meteorology is very disappointing. Within the century the world has seen physics, chemistry, biology, and other now recognized sciences emerge from their previous uncertain and indefinite condition, but meteorology is comparatively at a standstill. While much is known from thousands upon thousands of observations, many of the fundamental problems are not yet solved. Fifteen years ago von Helmholz turned his attention to the hydrodynamics of the atmosphere; but, so far as meteorology is concerned, this great man left his work unfinished. Recently excellent theoretical researches have been undertaken by Brillouin and Pockels on the formation of clouds and rain; by von Bezold, Herz, Margules, and Neuchoff on the thermodynamics of the atmosphere; by Kitao, Mohn, Sprung, Bjerknes, and Bigelow on the hydrodynamics of the atmosphere. Wild, Eckholm, Pernter, and Marchi have been prominent workers in the other field of the physics of the atmosphere. It appears, however, that not very much has been added to dynamic or theoretical meteorology since the publication of Ferrel's and Oberbeck's works. Meteorological generalizations at present are too indefinite, ascertained ideas too scanty and disjointed in their connection, to form fundamental principles. Any student of mathematical physic who peeps into this adjoining field must feel that he is like a bat in the dark, flying at the gleams of light from a closely curtained window. If science carries with it the idea of precision, meteorology must certainly be in the early stage of science.

And why is it that the advancement of modern meteorology is so slow? Is it because of the lack of complete meteorological data, notably in the upper regions of the atmosphere, or of the complexity of atmospheric phenomena? Or, will natural difficulties never yield to mathematical analysis until new methods of analysis shall have been developed? Whichever the case may be, what meteorology needs for its future advancement is a man like Newton, Laplace, Lagrange, Gauss, Poisson, or Fourier in astronomy and mathematics; Faraday, Maxwell, Helmholtz, Kelvin, or Stokes in physics; Bunsen, Mendeleff, or Van't Hoff in chemistry; or Charles Darwin in biology. Machines without a power to move on are useless, or the mere accumulations of observational data and mere possession of a new analysis are worthless without competent men to handle them. It appears that the brain of a genius is a mysterious workshop. Often, or rather almost always, this workshop is supplied with poor materials, and yet he builds up a wonderful thing out of them, which appears sometimes to be almost supernatural. A striking example of this is Clark Maxwell in the discovery of the electromagnetic theory. Before Hertz's famous experiments on electric waves or before the discovery of Röntgen rays, Maxwell used a few common physical hypotheses or data in building up his theory, but later, when his mathematical structure was complete, he cast aside the ladder, leaving so broad and comprehensive a system that Hertz once said that it is best defined as Maxwell's system of equations. For a long time Maxwell's theory was regarded as mere mathematical jugglery until Hertz eventually proved that it is physical reality. Another example of the kind is Fourier in constructing the mathematical theory of conduction of heat, the application of which principle to electricity made Ohm so famous. Fourier's theory had been discovered before any of the modern theories of heat was discovered. Or, did new experimental facts affect Fourier's theory?

The highest meteorological research will demand in the future the possession of the highest mathematical faculty, combined with experimental skill. It was a great misfortune to meteorology that a great genius like Maxwell did not attack our problems, or that Helmholtz died without completing his meteorological researches. Or if we had in our field Prof. Willard Gibbs, the most profound American mathematician, who has done so much for thermodynamics and the theory of gases, American meteorology might have been in a better condition. It is a great mistake that practical meteorologists have an aversion to the application of modern analysis in the study of meteorology. Experiments and mere reasoning can not go beyond certain steps. Instead, the history of science shows that mathematical analysis discovers the hidden chain which unites facts so widely distant from each other that ordinary reasoning could not even suspect their connection. At present we can not tell whether our present method of mathematical analysis is enough, or whether we shall need a new analysis for our purpose, but it is certain that the highest training in mathematical physics on the part of young meteorologists is not merely important but indespensable to the future advancement of meteorology. At the same time, meteorologists must invite eminent mathematicians and mathematical physicists to their field. Only thus may the observational data of the upper atmosphere or of the lower yield the best results, and meteorology may be able to enter the field of exact sciences.

INAUGURATION OF PRESIDENT DABNEY.

Dr. Charles W. Dabney, Assistant Secretary of Agriculture during President Cleveland's second administration, was installed as president of the University of Cincinnati on November 15–16, 1904, and, in the absence of Secretary Wilson and the Chief of the Weather Bureau, Prof. F. H. Bigelow had the pleasure of representing the Department on that occasion. Dr. Dabney has resigned his work as president of the University of Tennessee, and he has been welcomed most heartily into his new office at Cincinnati. The inaugural ceremonies were elaborate and enthusiastic, and a large number of educational institutions sent official delegates to take part in the exercises. The University of Cincinnati is a municipal institution, like the College of the City of New York; it has a beautiful site in the Burnet Woods Park, is well equipped with large buildings, and at present has about 1300 students in attendance. All those who were associated with Dr. Dabney during his residence in Washington will be pleased to know that he has fine prospects of performing a very useful work at Cincinnati.—*F. H. B.*

SEPTEMBER FLOODS IN THE SOUTHWEST.

The following reports of the recent floods in the Southwest were received too late for publication in the MONTHLY WEATHER REVIEW for September, 1904. They will be found very interesting as well as instructive. Those in New Mexico and southeastern Colorado were probably unprecedented, both as to volume of water and extent of territory affected, and their effect upon future engineering problems will doubtless be most pronounced. The Rio Grande floods were not so severe, yet the stages reached were quite high, and considerable damage was done to growing crops.

Among the lessons of these floods is the suggestion that the River and Flood Service of the Weather Bureau may be extended in these regions with at least a fair degree of utility. Two officials of the Bureau are now on the ground, examining the flooded districts with this end in view.—*H. C. Frankenfield, Professor.*

THE FLOODS IN SOUTHEASTERN COLORADO.

By F. H. BRANDENBURG, District Forecaster, Denver, Colo.

Flood stages occurred in a number of streams in southeastern Colorado on September 30 and October 1. The Purgatoire, or Picketwire, as it is known locally, on whose watershed the principal flood had its origin, rises in the Culebra

Range of mountains. The main stream, after receiving a number of tributaries rising to the southward in the Raton Mountains, empties into the Arkansas two miles east of Las Animas. Although draining 3040 square miles, the stream normally carries very little water; in fact, it is almost dry in its lower part, especially during summer and autumn.

In Colorado rain set in over the drainage area on the 27th and continued until the afternoon of the 30th. Along the Arkansas the fall was generally between one and two inches, while on the watershed of the Purgatoire, in Huerfano and Las Animas counties in Colorado, and in northern New Mexico it ranged from about four inches in the western part of Las Animas County to nearly six inches in the vicinity of Trinidad, and to about seven inches near the headwaters of the tributaries rising in the Raton Mountains in northern New Mexico. The entire upper watershed being a mountainous region, the run-off was great and rapid.

At Trinidad, where the flood was most disastrous, the loss probably reached $600,000. The river rose very rapidly; at 2 a. m. of the 30th it went over its banks, and at 3:30 a. m. it had spread a block or more on each side. Every bridge in the city, except one, was carried away; the Santa Fe railroad station was demolished, and 30 city blocks along the river were covered from two to four feet deep. The electric light and gas plants were flooded, leaving the city in darkness. The railroads sustained a large loss by washouts and a prolonged interruption to traffic. Ranchmen along the river for 50 miles or more lost their crops; in some instances they sustained considerable loss by the cutting done by the flood, and in others sand ruined much valuable farming land.

Before the flood in the Purgatoire reached the Arkansas that stream was somewhat swollen as a result of the rains, but the volume carried did not exceed 3000 second-feet. The great volume brought by the Purgatoire caused the Arkansas to leave its banks and attain a height equal to the high-water mark reached about 40 years ago. All bridges between Las Animas and the State line, except one at Granada, were washed out; bottom lands were badly washed or covered with sand; long stretches of railroad track were carried away or undermined, the damage being estimated at $200,000. At Lamar, about 30 miles east of the mouth of the Purgatoire, the flood stages were first noted about 6 a. m., October 1, and the water continued to rise steadily until 4 p. m. At the highest stage the river was fully one and a half miles wide. The river subsided slowly from that time until Tuesday, when it was again at its normal stage.

RECENT FLOODS IN THE RIO GRANDE VALLEY.

By W. H. ALEXANDER, Observer, Weather Bureau, Galveston, Tex.

The continuous and at times heavy rains that fell over western and southwestern Texas and southeastern New Mexico during September and the early part of October, 1904, kept the Rio Grande on the verge of overflowing its banks at various places along its course during this entire time, and on several occasions, and at a number of places it did overflow and flood the valley. The property loss in Texas on account of these overflows seems not to have been very great, but the inhabitants of the valley were kept in a state of constant alarm.

On the 8th of September the river observer at Eagle Pass, Tex., sent the following message to points below:

> River up seven feet and rising. Heavy rains reported above here.

On the 14th the following:

> River now up sixteen feet, and rising six inches per hour. Eight a. m.

On the 15th the following:

> Twenty-two feet. Slowly rising. Continued light rains here.

On the 16th the following:

> Reached twenty-four feet last night. Now falling.

From gage readings kindly furnished by Mr. W. W. Follett, United States Consulting Engineer, El Paso, Tex., it appears that the river at El Paso gradually rose from September 1 to 15, after which a gradual fall began. The highest reading recorded was 14.0 feet in the afternoon of the 15th.

Another series of readings from a gage located near Devils River Station, Tex., shows a gradual rise in the river from September 5 to 10, and a very rapid rise from the 10th to the 15th. The maximum reading recorded at this station was 28.1 feet on the afternoon of the 14th and the forenoon of the 15th. Gage readings at Fort Ringgold, Riogrande, Tex., show that the river at that point rose from 20 feet on the 10th to 30 feet on the 16th, and then began to fall.

The postmaster at Delrio, Tex., advises that the river at that point overflowed its banks on the 12th and 13th of September to a depth of seven feet, the water extending from 300 to 700 yards from the river bed, and causing an estimated property loss in that immediate vicinity of $500.

At Riogrande, Tex., the river overflowed its banks from September 16 to 22, resulting in the complete destruction of all crops planted along the river valley and a number of small shacks or huts. The crops destroyed were largely on truck farms, although a few cotton fields were also destroyed. It is intimated that the losses were heavier farther down the river, but no authentic information relative thereto has been received at this office.

During the last week of September very heavy rains fell in the upper Rio Grande Valley, especially in New Mexico, causing an overflow of the river in the vicinity of El Paso, Tex., and above, resulting in the loss of considerable property, principally railroad property, along the river in southern New Mexico. Just above El Paso a dike gave way and the water spread rapidly across and down the valley, forming lakes and streams, a part finally returning to the river channel. The damage to lands and buildings by reason of this overflow is estimated at $5000 or less.

On October 15, 1904, the observer at El Paso, Tex., advised the stations below as follows:

> No decided rise in surface of river last three or four weeks, but bottom has scoured out until average depth at point of average width appears to be seven or eight feet and water running fast.

The gage readings at El Paso show that the highest stage, 24.0 feet, was reached at 11 p. m. of the 15th of October. No authentic information has been received at this office of damages, if any, resulting from this rise in the river. They are believed to have been unimportant.

THE GREAT FLOODS OF SEPTEMBER IN NEW MEXICO.

By J. B. SLOAN, Observer, U. S. Weather Bureau, Santa Fe, N. M. *Revised reprint from* Report for September, 1904, New Mexico Section of the Climate and Crop Service of the Weather Bureau.

Between the 26th and 30th of September very heavy, steady rains fell over nearly the entire Territory, causing the most extensive and destructive floods in its history. The greatest damage occurred on Thursday morning, September 29, over the eastern slopes of the mountains and along the valleys and lowlands of the northern portion, but the floods were nearly as destructive over the eastern slope of the several mountain ranges in the southwest portion, and over the Hondo basin in the southeast. The reports from the voluntary observers show that from three to seven inches of rain fell in twenty-four to forty-eight hours, extending over an area about three hundred by five hundred miles. It is simply impossible to conceive the volume of water which this means; millions of tons, all rushing toward the sea, down the steep canyons and rapidly decreasing slopes of the valleys, carrying death and destruction in its path, for nothing placed by man can withstand the onward rush of the flood waters. An eye witness of a portion of the flood gave a vivid description of the meeting of the Mora and Sapello rivers, about a quarter of a mile above Watrous, in the following words:

Both streams were raging torrents. As they came together at an angle of about 45° the waters were hurled high into the air with a roar almost like Niagara; the two streams forming a veritable maelstrom as the monster currents struggled for the mastery. Swirling and tossing on the breast of the flood were heavy timbers, great cottonwood and pine trees, and fragments of roofs, fences, and corrals. It was a terrible and awe-inspiring sight. Just below the juncture of the streams they were hurled against the Santa Fe tracks, obliterating them as far as one could see. Half a mile down the valley stood the great steel bridge lately constructed. The big structure towered like a monarch above the floods, with the approaches on both sides gone, but supported by the two massive stone abutments. For a moment beneath and on both sides the flood rushed on its mad course of destruction, soon carrying the bridge and everything in its path.

On the terrible Thursday morning those who looked from the heights above Watrous gazed over five miles of wild, raging sea, which threw columns of spray high into the air and whose roaring would have silenced the sound of the most violent tempest on the iron bound shores of the Bay of Fundy. Past all imagination, conception, or belief, say those who witnessed the spectacle, was the fury of the flood at the confluence of the Mora and Sapello rivers.

Many homes throughout the Territory were carried away by the rushing, turbulent waters, overflowing from the canyons, arroyos, creeks, and rivers. Towns and cities were inundated and covered with water four to ten feet deep; rich farming lands and orchards were devastated, alfalfa fields washed out, and hay and grain destroyed, after having been cut and stacked. Over the ranges the low-lying meadows were covered with silt and mud, in places to the depth of several feet, rendering them useless for grazing, but the loss of live stock was not extensive. Many lives were lost in the isolated villages and numerous narrow, fertile valleys of northern New Mexico, but the exact number is not known.

In one of these narrow valleys, the Turquillo, in Mora County, noted for its beautiful meadows and fine crops of wheat, oats, barley, corn, hay, and alfalfa, with numerous canyons running into it from the adjacent mountains, the storm continued for four days and nights, increasing the volume of water every hour, and terminating in a flood that swept the valley. In places the flood was over a half mile wide and deep enough to cover thousands of cocks of hay, leaving only the crowns to be seen. At one point farther up the valley a lake of about five hundred acres was formed, and there it will remain for many weeks, as there is no outlet for the water.

Probably the greatest orchard loss was that of Mr. M. W. Mills, near Springer, which approximates $50,000. At his orchard ranch the bottom of the canyon was flooded to a height of 45 feet. The dam and head gate of his irrigation ditch were carried away, and the seven miles of the main ditch filled with sand, gravel, and rocks, including two miles of the fifteen-foot cut. The orchard at this point contained about 10,000 peach, 2000 apricots, 2000 almonds, 3000 cherry, plum, and other trees; nearly all were swept away, leaving only a few trees standing. The small fruits, berries, grapes, etc., were inundated and partly destroyed. On the lower side, farther down, about half way up the hill, about one-half of the apple and pear orchard was washed out, leaving only a narrow strip of trees. This fine orchard is practically a total loss, as that left is not considered worth the $10,000 that would be required to rebuild the irrigation ditch. Thousands of other trees, some estimated to be over 2000 years old, were carried down in the raging torrent. The river bed at this point is three times as wide as heretofore.

To illustrate the volume and force of the water the following facts are mentioned. In the Mora canyon, a few miles above Shoemaker, six miles of track and several bridges were washed out. In one place the river flows through a box canyon with high walls, and the railroad had been built through this canyon, but some distance above the ordinary level of the stream. The whole track was lifted bodily out of the long, narrow, winding, box canyon and hurled two miles farther down on the Shoemaker ranch. That it was done is apparent, but how can not be explained. Near Logan, spanning the Canadian River and belonging to the Rock Island Railroad, is one of the highest bridges in the west, 135 feet above the low-water mark. It was several hundred feet long, built of steel and thought to be strong enough for any purpose, but more than two hundred feet of the steel structure is missing, having been carried by the flood, which rose until it splashed over it, to the sand bars below. A portion of the bridge was saved by running a heavily laden train of coal cars upon it. Over the adjacent mountains and in the Santa Fe Valley the rainfall was the heaviest on record. On Thursday evening, within two hours after the flood first struck the protecting dam of the reservoir, three miles east of Santa Fe, 250,000,000 gallons of water had passed into it and were rushing over the spillway, 175 feet long, at a height of three feet.

At the same time the open ditch, built on the south side of the reservoir, to dispose of flood waters and having a capacity of 750 cubic feet per second, was running bank full, in places even overflowing. It was estimated from subsequent measurements that when the crest of the flood reached the upper or protecting dam, the river was running about 2000 cubic feet per second, and it continued at this rate into the night. About 9 o'clock the following morning the water was flowing over the spillway to a depth of 32 inches. Twenty-four hours after the flood waters reached the reservoir the flow measured 750 cubic feet per second. On Sunday, the fourth day, it had diminished to 400 cubic feet, and on the 10th day it was still flowing 100 cubic feet per second. The grade of the river for eighteen miles above the reservoir, according to survey, averages 125 feet to the mile, and, when this is taken into consideration, the long continued heavy flow is remarkable and can not be accounted for unless it was due to hail that fell in immense quantities in the higher mountain ravines and canyons and slowly melted, as it is known that hail fell in the canyon above the reservoir.

Table showing daily and total precipitation during flood period (in inches and hundredths).

Stations.	September, 1904.					Total.
	26	27	28	29	30	
Alamogordo	.....	.80	.55	.75	.....	2.10
Albert	.10	.....	.22	2.40	1.54	4.24
Albuquerque	T.	.....	.....	.86	.....	0.86
Arabela	T.	.08	.51	2.70	1.88	5.17
Bell Ranch	.....	.....	T.	2.17	1.87	4.04
Cambray	.....	.....	1.25	.80	.....	2.05
Carlsbad	.....	.....	.....	.95	.....	0.95
Cloudcroft	.10	2.80	1.40	.90	.....	5.20
Deming	.16	.....	1.20	1.10	.....	2.46
Dorsey	.....	.50	.96	2.65	2.77	6.88
Eagle Rock Ranch	.90	.19	*	2.30	3.61	7.00
Elk	.....	.....	.....	3.43	.38	3.81
Engle	.....	4.20	1.00	.....	.....	5.20
Fort Bayard	T.	.....	.74	.56	.....	1.30
Fort Stanton	T.	.....	1.00	2.00	2.86	5.86
Fort Union	1.80	.70	1.50	2.30	.....	6.30
Hillsboro	.09	.....	*	3.25	.....	3.34
Las Vegas	.05	.10	.26	2.87	1.77	5.05
Los Lunas	.....	.....	.....	1.85	.....	1.85
Mesilla Park	T.	T.	1.63	.....	.....	1.63
Mountainair	T.	.....	.25	1.56	.10	1.91
Raton	1.50	.80	1.10	3.88	.....	7.38
Rociada	T.	.60	*	4.52	2.80	7.92
Roswell	.....	.....	.42	.75	.....	1.17
San Marcial	.....	.....	.....	2.00	.....	2.00
Santa Fe	.17	.33	.....	1.08	1.43	2.81
Springer	.....	.50	.30	3.10	1.50	†5.40
Socorro	.21	.....	.....	3.61	.....	3.82
Strauss	.....	.....	.60	.55	.....	1.15
Taos	.23	.....	*	1.62	.....	1.85
Vermejo	.05	.37	.63	2.30	1.60	4.95
W. S. Ranch	.86	.62	1.50	3.67	.61	6.66
Amarillo	.....	.....	1.68	.26	.....	1.94
El Paso	.....	T.	.13	.92	.02	1.07
Averages	.18	.37	.56	1.87	.71	3.69

* Amount included in following day. † Incomplete.

Without the protection of this reservoir, which holds about 450,000,000 gallons of water, the damage to the city of Santa Fe would have been enormous. A few miles below the city the river bed for about twelve miles was widened to 60 feet and cut 30 feet deep, forming an impassable barrier.

The most extensive damage was done to the various railroads throughout the Territory, and undoubtedly exceeds $1,000,000. Miles upon miles of track and numerous bridges were carried away or damaged. Passenger and freight business was stalled or interrupted for several weeks, and towns and cities were isolated and cut off from supplies and mail. Telegraph wires were prostrated in all directions and local offices were not in direct communication with the terminal cities for over two weeks, although messages were detoured to the principal New Mexico cities over patched wires within a few days after the storm subsided.

At the present writing it is impossible to definitely state the aggregate loss in the cities, towns, and small settlements, or to the farms and ranches throughout the Territory, but it is believed $1,000,000 is a conservative estimate.

The accompanying table shows the daily rainfall of the flooded districts. It will be observed that the precipitation over the entire area approximated two inches on the 29th, the day of the greatest flood disaster, and that the total for the five days was practically four inches, while in the stricken northeast quarter of the Territory six inches occurred within this period.

NOTES AND EXTRACTS.

ROYAL METEOROLOGICAL SOCIETY.

We are informed that His Royal Highness the Prince of Wales has graciously consented to become patron of the Royal Meteorological Society.

Those who are familiar with the history of the New England Meteorological Society, its rapid growth and great usefulness, but eventual dissolution, and with other efforts to establish a similar vigorous society in this country and elsewhere, must have wondered why such efforts often came to naught, but the reasons are not far to seek. A society will not live a healthy life unless, like a man, it has plenty of exercise and useful work to do, and funds to pay expenses, and the stimulus that comes from the conviction that it is really accomplishing its work. What is so discouraging as to strive for a mountain top, yet find oneself perpetually laboring along in ravines and valleys. One must have an occasional outlook from a peak in order to feel that he is steadily nearing the summit; every descent into a valley must be made with the assurance that the next greater height will be attained beyond. So with a society of men banded together for a definite purpose, the initial enthusiasm and money will not suffice unless the members can see that progress is being made toward the object in view; the attainment of one point must be followed by striving after another just beyond. Thus it is that the best scientific research is stimulated step by step; one climbs and enjoys each point of view. What use have we for a society that has no special work to prosecute, no great object to attain, no vigorous life?

Happily for the Royal Meteorological Society of London it has done good work, and its leading spirits foresee that there is more yet to be done. A friend familiar with the development of meteorology in England tells us that—

> There has been a good deal of effort made in England since Dr. W. N. Shaw became chief of the weather service to raise the whole tone of meteorological investigation in England. This has taken the form partly in the direction of inducing the government to reorganize the Meteorological Office and spend larger sums on its maintenance, and partly in the direction of raising the standing of the Royal Meteorological Society.
>
> Sir John Eliot is just now working hard to induce the government to consider a plan of cooperation for the whole British Empire in dealing with meteorological observation (see his British Association address) and a good deal of work of this kind is evidently going on behind the scenes. I take it that the fact of the Prince of Wales becoming a patron is a "straw" which shows that some success is being achieved in persuading the government of the importance of the work to be done; there has been in the past and seems likely to be more in the future of cooperation between the Government Meteorological Service and the Meteorological Society. There is usually a good deal of care and inquiry made as to the standing of any society of this kind before a member of the royal family becomes a patron.—*C. A.*

JOURNAL OF THE METEOROLOGICAL SOCIETY OF JAPAN.

The last number of the Journal of the Meteorological Society of Japan, Tokio, September, 1904, 23d year, No. 9, contains the following announcement:

> The Meteorological Society of Japan, founded in 1882, counts at present more than 260 members. The president of the society is His Excellency Vice-Admiral Viscount Yenomoto. Its organ is the Kishoshushi (Meteorological Journal), of which more than 180 volumes have already been published. The language used in this journal has hitherto been exclusively Japanese; but, in the future, it is intended to insert occasionally articles on Japanese meteorology as well as other scientific matters in English, French, or German.
>
> It is earnestly desired that our readers will favor us with contributions to our journal.

The only article in this number in any European language is by T. Okada, and is entitled "On the underground temperature observations made at Nagoya, Japan." Observations of ground temperature were made at various depths up to twelve meters, for periods varying from ten years for the lesser depths to four years for the greatest. The soil is a mixture of sand and loam, with a surface of sod. The author decides that the diffusivity, which differs widely in different strata, is greatest at a depth of one and one-half to three meters, where it amounts to 0.00899, and that the stratum of invariable temperature is found at about twelve meters.

The remaining articles of the September number, all of which are in Japanese, are as follows:

"On the snow temperature observations made at Sapporo." By K. Abe.

"Fishery and climate in the Inland Sea for the year 1904." By Y. Yamaguchi.

"On the connection between earthquakes and atmospheric pressure." By Hioya.

"On lunar phases and weather." By Seisan.

"Climate and the development of silkworms at Fukuoka and Kanayama in 1904." Kanayama Meteorological Station.

"Notes: Monthly weather review for August."—*F. O. S.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. James L. Bartlett, Observer, Madison, Wis., gives the following brief outline of the course in meteorology that he will offer at the University of Wisconsin during the second semester of the present college year:

1. The principles of meteorology. The properties and phenomena of the earth's atmosphere, including barometric pressure, temperature, precipitation, fog, dew, frost, clouds, the general circulation of the atmosphere, and general and local storms. The weather and climate of the United States.

2. Explanation of the meteorological apparatus in use at the Weather Bureau office, and instruction in its use. Instruction and laboratory work in taking and recording observations.

3. Instruction in the preparation and use of the weather map, forecasts, and warnings. Laboratory work in drawing isobars and isotherms and in making forecasts of the weather.

Mr. Edward L. Wells, Observer, Boise, Idaho, on October 21 addressed several classes from the public schools of the county. The structure and use of the instruments were explained, the methods of collecting and disseminating meteorological information were described, and methods of forecasting were touched upon, with some reference to the fallacy of long-range forecasting as at present attempted.

Mr. W. D. Maxwell, Observer, Rapid City, S. Dak., lectured on October 3 to the high school class in physical geography on atmospheric pressure, and its relation to the movements of storms across the continent. He also explained the construction and use of Weather Bureau instruments.

AWARD OF THE BUYS BALLOT MEDAL.

The proceedings for June 27, 1903, of the Koninklijke Akademie van Wetenschappen te Amsterdam contain an extract of the report made by the committee of advice for the according of the Buys Ballot medal. This committee consisted of Messrs. Julius, Haga, Zeeman, Van der Stok, and Wind, and their report gives so interesting a sketch of the work of the most active pioneers in the exploration of the upper atmosphere that it is briefly summarized herewith.

Recognizing the great importance to theoretical meteorology and to our knowledge of the general circulation of the atmosphere of the aeronautic investigations of recent years, the committee wished to award the medal to some one distinguished in this line of research. As it was impossible to select any one investigator as the only founder and original promoter of this work, the committee endeavored to choose, among the many who have carried it on, him whose efforts and achievements had made him the most conspicuous. This was by no means an easy task. Special commendation is accorded to Rotch, the founder and director of the Blue Hill Observatory, who first made use of kites on a large scale and for systematic observations, and who also set the example of flying kites from steamships, for the sake of the wind thus artificially produced or modified; to Teisserenc de Bort, who has used both kites and balloons on an exceptionally large scale both in France and in foreign countries; to Hildebrandsson, whose zealous, patient, and skillful work in the observation of clouds and in the development of simultaneous international cloud observations is worthy of admiration, and who has derived from the results obtained knowledge that may materially modify previous theories, since it tends to show "that in the northern temperate zone both the upper and the lower air on an average perform a whirling movement in the sense of the earth's rotation around the pole as a center, but with a centripetal component in the lower, a centrifugal component in the higher layers, a movement therefore quite different from the southwestern lower current and the northwestern higher current almost generally adopted hitherto"; and to Hergesell, who has not only himself investigated these problems, but, as chairman of the international aeronautic committee, has initiated the simultaneous international balloon ascents, carried out once each month since 1900 at ten different stations.

But the unanimous choice of the committee falls upon Richard Assman and Arthur Berson, editors of Die Wissenschaftlichen Luftfahrten des deutschen Vereins zur Förderung der Luftschiffahrt in Berlin, in which they have laid down the foundations, the course, and the results of their highly important series of observations. This publication describes the balloon expeditions, 75 in all, made from 1888 to 1889. The provisional results of a more general tenor obtained in these voyages are thus summarized by the committee:

1. Formerly it has sometimes been thought that the temperature in the higher layers of the atmosphere approached a limit of —35° to —50° C.; these investigations, however, do not at all point to the existence of such a limit. Temperatures also considerably lower than the above have come to light.

2. In the lower layers of the atmosphere the temperature, in rising, diminishes on the whole less rapidly than would answer to convective equilibrium. Above 4000 meters, however, the rate of decrease grows larger and seems to approach that value of nearly 1° C. per 100 meters as a limit. This is in keeping with a supposition of von Bezold based on theoretical grounds, whilst the behavior in lower layers can be accounted for by the influence of radiation, condensation, and evaporation.

The distribution of temperature found in this way is satisfactorily in agreement with the one found by Teisserenc de Bort, but disagrees considerably with that which was formerly determined by Glaisher.

3. The diurnal variation of temperature has, at a height of 2500 meters, shrunk down to less than one-tenth of its amplitude at the surface of the earth.

Of the annual variation of temperature the amplitude decreases rapidly at the lowest layer of 500 meters. Higher on it is rather a retardation of the maximum and minimum of temperature than a decrease of amplitude, which is still obvious. At a height of 4000 meters the highest and lowest temperatures seem to occur about the middle of September and March. The nonperiodical changes of temperature in the higher layers are hardly less intensive than at the surface of the earth.

4. Frequently low, but also sometimes higher in the atmosphere, there are layers in which the temperature increases instead of decreasing with the height. "Inversions" to an amount of even 16° C. have been observed.

Not seldom there are also layers in which the temperature in rising diminishes more rapidly than would answer to the convective equilibrium. It is very remarkable that these layers, which obviously tend to provoke a state of instability in the atmosphere, are often of a great thickness, reaching even 2500 meters for instance.

5. In accordance with results which Hann came to in the Alps, it has appeared that above middle Europe, both in winter and in summer, the temperatures at equal heights in anticyclones are in general higher than in cyclones, this, at least, holding good for heights up to eight kilometers. This result tends to corroborate the conviction of most meteorologists that the cyclones with their ascending and the anticyclones with their descending currents of air can not, as a rule, simply owe their existence to differences of temperature. By still more recent investigations it has appeared that the rate of decrease of temperature above the anticyclones, though at first smaller, is at greater heights greater than that above cyclones, so that it remains possible that in the very high layers of the atmosphere the temperature above the anticyclones is lower than above the cyclones.

6. In most of the cases several layers of a quite different nature and origin were clearly indicated in the atmosphere.

7. In rising, the moisture of the atmosphere generally decreases more than Hann had derived from observations of mountain stations and from those made by Glaisher.

8. Important data have been acquired about the formation and origin of clouds in connection with the distribution of the meteorological elements.

9. The velocity of wind increases with the height, strongly in the layers below 1000 and above 3000 meters, less so between these two heights. At a height of 5000 meters it was on an average four and five-tenths times as large as at the surface of the earth. Important data were also acquired about the difference in the direction of the wind between the lower and higher parts of the atmosphere.

10. Thermally and electrically the surface of a layer of clouds has a similar effect upon the region above it as the surface of the earth.

11. The rate of decrease of electrical potential seems to diminish when rising, and even to vanish entirely in the higher regions of the atmosphere. The result, arrived at from only a few observations, has afterwards been corroborated.

While, in the opinion of the committee, it is chiefly as editors of this important publication that Assman and Berson have won the distinction recognized in the award, they have rendered other services that the committee desires to emphasize: Berson by the intrepidity with which, in company with Süring, he has undertaken an expedition to altitudes whose extremely low temperature and greatly diminished pressure are dangerous to life—an expedition carried out for the sake of comparing the observations obtained from registering balloons with eye observations in a manned balloon started at the same time; Assman by the construction of the aspiration psychrometer and of the "Platz" balloons, made of caoutchouc, which attain to a height of 20 to 30 kilometers; and both Assman and Berson by their work since 1899 at the aeronautical observatory at Tegel, founded and directed by the former, where daily kite and balloon observations are made.—*F. O. S.*

LONG-RANGE FORECASTS.

By H. B. WREN, Observer.

[*Extract from the* Report for September, 1904, Maryland and Delaware Section of the Climate and Crop Service of the Weather Bureau.]

The ceaseless change in the midst of essential stability and permanence that is apparent among the heavenly bodies suggests a relation between those movements and the destinies of men and of nations. So obvious is this analogy that it is not strange that in the childhood of the race it was exalted into an absolute causal connection.

Astrology once permeated all religion, all science, and even politics; and the baneful influence of unfounded, unreasonable, or portentious predictions is not a modern affliction. Montaigne, the French philosopher and essayist of the sixteenth century, remarks that "a large sum of money was lost on 'Change at Rome by this prognostication of our ruin," referring to the prediction by Italian astrologers of the downfall of the French nation. Dean Swift, the powerful satirist, wrote "Predictions for the year 1708, by Isaac Bickerstaff, Esq.," to emphasize the absurdities and weaken the influence of long-range forecasters.

The infinite desirability of foreknowing the seasons for the benefit of husbandmen is at once the opportunity of charlatans and the justification of national weather services. It avails little to decry the methods of impostors or to brand them as fakirs; the court of final resort must always be a comparison of results, and such comparison every one can now make for himself. Weather maps showing the actual conditions on every day are now published by practically every civilized nation and are accessible to all; and all that is needed to cure the most implicit belief in almanac predictions is an honest comparison of these predictions for a single season with the actual occurrences as shown by these maps. Conspicuous instances of failure, such as those of the artificial rain makers, who, a decade ago, were given the fullest opportunity to test and exploit their theories, or the colorless results of the extensive campaign of bombardment as a protection against hail, conducted for several years in southern Europe, do not convince the credulous. They do serve, however, to illustrate the "confusion of tongues" among the prophets of these latter days, who bombard the skies to precipitate storms, and bombard the clouds to dissipate them. Government meteorologists are not alone in the denunciation of the fallacies, absurdities, and pernicious effects of so-called long-range forecasts. Professor Young, probably the foremost American astronomer, speaking of lunar influences, points out that the frequency of the moon's changes is so great that it is always easy to find instances by which to verify a belief that changes of the moon control conditions on the earth. A change of the moon necessarily occurs about once a week. All changes of the weather must therefore occur within three and three-fourths days of a change of the moon, and one-half of all changes ought to occur within forty-six hours of a change in the moon, even if there were no causal connection whatever. Now it requires only a very slight predisposition in favor of a belief in the effectiveness of the moon's changes to make one forget a few of the changes that occur too far from the proper time. Coincidence enough can easily be found to justify preexistent belief.

Those who are in a position to know are well aware that every possible effort is being made to extend our knowledge of the laws that control weather conditions, and meanwhile to give to those who are vitally concerned the most trustworthy information obtainable.

The problem of seasonal forecasts is receiving at the hands of the ablest and most painstaking students of both continents a comprehensive consideration that is certain to be fruitful and far-reaching in its ultimate results. So important and so pressing is this work and so promising is the field, that the Chief of the Weather Bureau is building and equipping a large observatory, wherein the best talent available will soon be employed to study the intricate and profound problems of the atmosphere, whose solution promises improvement over present methods and results in forecasting, and may lead in time to seasonal predictions on a truly scientific basis.

EFFECT OF RAINFALL ON THE PALM OIL TREE.

[*Extract from* British Colonial Reports—Annual, No. 427. Lagos. Report for 1903. Communicated by W. R. Buttenshaw, Imperial Department of Agriculture for the West Indies.]

The very remarkable shrinkage in the exports of 1903 as compared with those of 1902, as regards cacoa, palm kernels, and palm oil, is the result of highly unfavorable meteorological conditions, which well deserve special consideration. It is purely a question of rainfall.

As regards palm produce, the following pertinent paragraph may be quoted from the report of a commission to the governor of Lagos, in 1898:

The yield of fruit from the palm oil tree (*Elaeis guineensis*) varies according to rainfall. With a sufficiency of moisture the tree flowers every five or six weeks, and bears eight or nine mature bunches of fruit in the year, but if the rain supply is scanty the tree flowers only every ninth or tenth week, and the annual yield is reduced to about five bunches. In normal times the *Elaeis* bears eight heads (so-called nuts) in the year, but it follows a similar habit to the cocoanut, the heads being formed spirally and the axils of the leaves at regular intervals, which are long or short, according as the season is favorable. The mischief arising from insufficient rainfall does not finish with the number of heads, for the oil is extracted from the fibre of the thin outside layers of the fruit, which are either red, ripe, succulent and rich with oil, or starved, yellow, and destitute wholly or partially of oil, according to the amount of moisture afforded to the tree during the time the fruit has been maturing.

The following table has been prepared to show the yearly rainfall, in inches; the yearly export of palm oil, in gallons; and the export of palm kernels, in tons:

Year.	Rainfall.	Palm oil.	Palm kernels.
	Inches.	*Gallons.*	*Tons.*
1887	70.80	.....	.....
1888	49.87	2,446,705	42,525
1889	61.61	3,349,011	32,715
1890	90.88	3,200,824	38,829
1891	64.26	4,294,835	42,342
1892	69.68	2,458,260	32,180
1893	82.55	4,073,055	51,456
1894	70.10	3,393,533	53,534
1895	80.62	3,826,392	46,501
1896	74.23	3,154,333	47,649
1897	51.10	1,858,968	41,299
1898	80.20	1,889,939	42,775
1899	83.46	3,292,851	49,501
1900	72.82	2,977,926	48,514
1901	112.59	3,304,055	57,176
1902	47.82	5,240,137	75,416
1903	70.08	3,174,060	63,568

The correlation between rainfall and the quantity of palm produce exported from the colony is shown in an unmistakable manner by the above figures. They are given here in detail, because the falling off in the exports of 1903 was not understood by British merchants.

It will be noticed that the effect of an unusually great or abnormally small rainfall is sometimes felt most in the exports of the following year. This arises from the fact that the rainfall is divided into the former and the latter rains. Thus, in 1901 there was the unprecedented fall of latter rain of 31 inches in September and October, the effects of which are seen in the record export of 1902.

An examination of the above figures will show that the export of palm oil is even more sensative to rainfall than the export of palm kernels.

The greatest rainfall, that of 1901, preceded the almost phenomenally large export of vegetable produce in 1902. The short rainfall of 1902 enabled an intelligent observer to predict with certainty a great falling off in produce in 1903.

SEASONAL RAINFALL RÉGIMES IN THE UNITED STATES.

Prof. V. Raulin, of Montfaucon, France, advocates the classification and publication of precipitation statistics by meteorological seasons in place of, or in addition to, the calendar months and year. In a recent letter he incloses a map, fig. 1, showing the division of the United States into "régimes" based on the seasonal precipitation, as determined from the data of Weather Bureau Bulletin D. Professor Raulin states:

* * * the climatic chart is very interesting and shows clearly that precipitation is abundant in the neighborhood of the Atlantic Ocean, and decreases in the interior as far as to the neighborhood of the Pacific

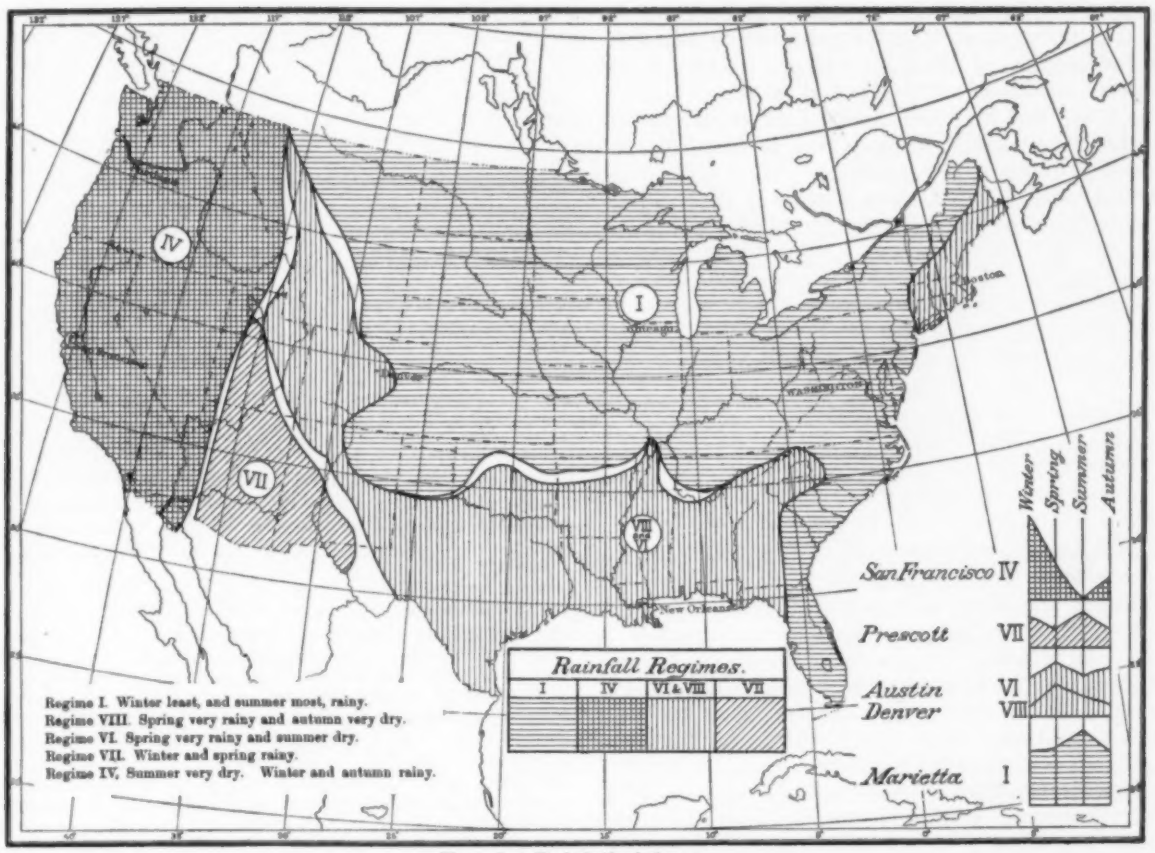

FIG. 1.—Rainfall régimes.

Ocean; viz, 60–50 inches on the Atlantic coast decrease to 40–30 in Mississippi and Missouri (St. Louis), to 20–15 in Colorado (Denver), to 10–5 in Arizona. Then it increases to 50–60 on the coast of California, and reaches 100 inches in the district of Juan de Luca by Neah Bay. But what the chart does not show is the influence, so important in Europe, of the ocean on the distribution of rain.

On the eastern coast, by the Atlantic, the greatest rainfall takes place in the spring and summer, while on the western coast, by the Pacific, the principal rainfall occurs in the fall and winter, with absolutely no rain in the summer, as in San Francisco.

It is also a fact that the Atlantic coast from New York to the southern end of Florida has the same regimen as the interior, which is the reverse of the conditions in Europe, where the coast districts always have more rain, as may be seen on my chart of France or on my chart of western Europe.

You will note on the accompanying map the continental normal régime, (I), the marine régime (IV), and the intermediate and semimarine régimes (VII, VIII, and VI). There are also other régimes at some isolated stations, but on account of the smallness of the map I can not indicate them. You will note that régime I (normal) occupies a large surface, both in the interior and on the Atlantic coast, that the modifications VIII and VI seem to be influenced by the Gulf of Mexico and the Pacific, and that the entire régime IV and modification VII are influenced by the Pacific Ocean.

For forty years I have been of the opinion that these régimes are of great importance to agriculture and industry, and that it would be useful to indicate the different zones of annual rainfall on the rainfall charts.

TROPICAL STORM OF OCTOBER 10 TO 20, 1900.

Mr. Paul DeGraw, Assistant Observer at Havana, Cuba, forwards a record of daily weather conditions at Havana during the tropical storm that apparently was central over or a little south of central Cuba on October 15, and remained stationary over southern Florida from the morning of the 17th until the morning of the 19th. Mr. DeGraw's report may be briefly summarized by saying that the wind was generally fresh to brisk from the northeast from October 10 to 15, reaching a maximum of 36 miles per hour on the 11th. The barometer fell slowly and continuously from the 8th to 3 a. m. on the 16th, when it reached 29.58 inches, and at 2:30 p. m. on that date the wind backed to northerly and diminished in force. Cloudy weather with frequent light showers prevailed from the 11th to the 16th, followed by clear weather on the 17th, but showers again occurred from the 18th to the 21st.

The barometer rose on the 16th, remaining nearly stationary until the 19th, when it fell slowly, recording 29.58 at 6 p. m., and 29.57 at 4 a. m. of the 20th, beginning to rise again in the evening of the 20th, and rising rapidly throughout the following day. The winds on the 17th and 18th were light and variable, but gradually backing to the southwest and south, increasing in force from the 19th to the 21st, and gradually veering to northwest by the afternoon of the 20th. A moderate sea swell, observed for the first time on the 14th, increased gradually in force.

Mr. DeGraw incloses two reports from the neighborhood of Cienfuegos and also the following translation from the log of the steamship *Buenos Aires*, Transatlantica Espanola Line, which arrived in Havana October 21, seven days and eleven hours from New York:

At 6 p. m. of the 16th we experienced, in the mouth of the Bahama Channel (Florida Strait), strong winds from the northeast, in which direction showers completely shut off the view. Inasmuch as we were unable to discern the lights of Jupiter, we turned our prow to the wind and lessened speed. On the morning of the 17th we discovered a cyclone to the south, and, supposing that its path would have to be the coast of Florida, we continued to face the wind and maintained the low speed of twenty revolutions.

On the morning of the 18th the characteristics of the cyclone were more marked and the wind veered to the east, with gusts of hurricane strength.

At nightfall we again intended to enter the channel, but at midnight the wind became so bad that we were forced to desist.

On the morning of the 19th southeast winds prevailed; we changed the vessel's course, and began to sail in this direction. That night the rain was so heavy and the wind so strong that it became necessary to moderate the speed of the engines to the lowest possible velocity.

We continued in this way until the morning of the 20th, during which day, the weather being somewhat cleared and the winds veering to the southwest, we recognized Cayo Sal, and headed for Havana.

Reports from Mr. L. F. Hughes at Central Soledad and from

Mr. P. M. Beal at Colonia Guabairo, estates distant respectively eight and ten miles from Cienfuegos, show a sequence of weather changes in general similar to that at Havana, but the lowest barometer readings were recorded on the afternoon or evening of the 15th, and the wind backed to southwest by the morning of the 16th. The precipitation is given in the following table:

Precipitation, in inches, October 10–22.

Date.	Cienfuegos.	Central Soledad.	Colonia Guabairo.	Havana.
October 10	T.	.....	.....	.33
October 11	0.42	0.78	0.40	0.45
October 12	0.71	0.45	0.37	0.15
October 13	0.32	1.02	0.55	0
October 14	0.20	0.03	0.03	0.56
October 15	T.	0.08	0.11	0.30
October 16	1.39	2.20	3.13	0.74
October 17	2.19	0.76	1.10	0
October 18	1.83	1.50	2.72	0.67
October 19	0.96	1.47	.....	0.60
October 20	0.14	.....	.....	0.38
October 21	0.99	.....	.....	0.02
October 22	0.36	.....	.....	0

The daily precipitation at Cienfuegos and Havana is the total for the twenty-four hours ending at 8 p. m. The hour at which precipitation was measured at the other places is not stated, and the four columns may not be strictly comparable as regards time. Mr. Hughes states that there are several rain gages on different parts of the estate, and that all of them measured different quantities each day, showing that the rain fell in squalls of unequal intensity. On October 21 a shower at an out station measured 3.35 inches in less than an hour.

The Havana Post of October 22 records the experience of the Peninsular & Occidental steamship *Martinique*, which left Havana for Miami, Fla., at 4 p. m. on the 14th and arrived at Key West thirty-three hours later, being delayed in crossing the Gulf by the storm. Between Key West and Miami the ship encountered extremely high winds and seas, and put into Hawk's Channel for shelter, where, on the 16th, the wind was estimated at 50 miles per hour, increasing to 75 miles. "Every room that had a window open was filled with dozens of little birds, while the deck was littered with dead ones that struck the houses and masts in their flight through the darkness, pushed ahead by the fierce storm."—*F. O. S.*

THE DECHEVRENS ANEMOMETER. COLD WAVES.

In the MONTHLY WEATHER REVIEW for March of this year Rev. Marc Dechevrens describes his anemometer for the measurement of the vertical component of the wind, and notes by Professors Abbe and Marvin are added. In a recent letter Father Dechevrens replies to these comments and also refers briefly to his theory of cold waves. A translation of some portions of the letter follows:

I have never attempted to disguise the difficulties inherent in this kind of observations. I had previously expected in China to be able to elevate the windmill on a tower 33 meters high, made for the purpose. Once established at Jersey, I did not rest until I had erected another tower, both higher and more slender, in order to continue my researches on the vertical component of the wind.

I may say that all the precautions enumerated by Professor Marvin have been taken in order to insure the verticality of the principal support, which is a strong tube of steel, ten centimeters in diameter, absolutely inflexible, and also the verticality of the axis of the windmill on its horizontal arm. As regards the latter, I have not been able to do away with an inclination of the axis of eight minutes, but all the hourly velocities have received a corresponding correction.

The movements of this windmill are very complex and curious. I think that one should be very cautious in attributing them to causes other than movements of atmospheric currents. It is a phenomenon that one must observe for himself and under the best conditions. Unfortunately no observatory has been willing, like myself, to undergo the considerable expense of a suitable installation.

Allow me to add some reflections on the subject of your correspondence with Professor Stupart in the MONTHLY WEATHER REVIEW for March, 1904; the primary and principal cause of cold waves. Already, in 1898, on the occasion of the cold wave of November 26, discussed at length and with charts in the MONTHLY WEATHER REVIEW, I was convinced that these cold waves of the United States proceed from the same cause as our cold waves in Europe. Both accompany anticyclones, or follow cyclones, or more often still appear between two centers of low pressure. Professor Stupart is no longer willing to regard radiation as a sufficient cause for such cold, and he now repeats what I said in 1886 and what I have not ceased to say since: some other cause than radiation is needed to explain this phenomenon. In my belief, the only truly efficacious, truly adequate cause of these great cold waves is the dispersion of aerial masses, which descend in the high pressures and expand over two gradients in the directions of the two centers of depression. Consider the chart of November 26, 1898. You will see there a complete sheet of winds from the southeast and south, whose direction is toward Montana, where the temperature is 20° F. at the center of a low; and another sheet of winds from the northwest, whose direction is toward another low over Lake Erie, with a temperature of 28° F. The dividing line between these two systems of winds is over an area of high pressure with a temperature of about —10° F. Impossible that such a fall in temperature should be due to radiation, especially that the fall should have been greater in the wind from the south, to which one attributes a temperature naturally higher than in the wind from the north.

The cold waves, therefore, are no more confined to polar currents than are the warm waves to equatorial currents. Cold will always be found associated with currents of dispersion, and heat with currents of concentration.

If to this idea of horizontal winds of dispersion and concentration is added another conception, to which I gave equal emphasis in 1886, the conception of two superposed eddies forming together the cyclone, and two others forming together the anticyclone, we may thus most simply explain the distribution, so curious, of temperature along the axes of cyclones and anticyclones, such as has been revealed to us by observations on mountains, and more recently and more completely by balloons.

CORRIGENDA.

MONTHLY WEATHER REVIEW for August, 1904, p. 371, column 1, table, insert "p. m." after the figures expressing time: eighth line below table, strike out "counting from 0^h at midnight to 24 hours."

THE WEATHER OF THE MONTH.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean pressure for the month was high over the region from Kansas and the Indian Territory northeastward to the Atlantic Ocean in the latitude of New Jersey, and eastward to east-central North Carolina, with the crest over the mountain regions of West Virginia, southwestern Virginia, and eastern Kentucky. Another area of high mean pressure occurred over portions of the northern and middle Plateau regions.

The mean pressure was low over the Florida Peninsula, and portions of the southern Plateau region. The minimum mean reading was reported at Key West, Fla.

The mean pressure was above the normal in all regions, except the Forida Peninsula, extreme northern California, western Oregon, and southern and western Washington.

The greatest excess in mean pressure occurred in portions of the Plateau and slope regions, and over the central districts from the middle slope region eastward to the Atlantic Ocean over southern Pennsylvania and to eastern North Carolina. The greatest deficiency in mean pressure occurred over southern Florida.

The mean pressure decreased from that of September, 1904, over southeastern North Carolina, eastern South Carolina, the southern portions of Georgia, Alabama, and Mississippi, southeastern Louisiana, Florida, eastern New York, New England, western Washington. west-central Minnesota, eastern and northern South Dakota, and the southern portion of North Dakota. In all other districts there was an increase.

The greatest increase in mean pressure occurred over the middle Plateau region, where it amounted to +.10 inch; and the greatest diminution over southern Florida where the changes ranged from —.11 to —.14 inch.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart V.

The mean temperature was below the normal in the Atlantic States north of central South Carolina, except east-central North Carolina, in the lower Lake region, eastern portion of the upper Lake region, the upper Rio Grande Valley, New Mexico, Arizona except the south-central portion, the southern portions of Utah and Nevada, and eastern California. In all other districts the mean temperature was above the normal. In the region from Louisiana and eastern Texas northward to the British Possessions and in the northern slope and eastern portion of the northern Plateau regions the excess was marked, with a daily average of + 5.2° to + 5.7° in north-central South Dakota, southwestern North Dakota, and east-central Montana. The greatest deficiencies ranged from — 2.0° to — 3.7° and occurred in northeastern Virginia, District of Columbia, eastern Maryland, Delaware, southern New Jersey, central New York, Connecticut, western Massachusetts, the southern portions of Maine, New Hampshire, and Vermont, and north-central Arizona.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	48.1	— 2.1	—19.6	— 2.0
Middle Atlantic	12	53.8	— 1.7	—18.4	— 1.8
South Atlantic	10	63.1	0.0	—10.8	— 1.1
Florida Peninsula*	8	74.7	+ 1.8	+ 3.1	+ 0.3
East Gulf	9	67.8	+ 2.0	— 2.3	— 0.2
West Gulf	7	69.3	+ 2.2	+ 6.9	+ 0.7
Ohio Valley and Tennessee	11	62.0	+ 0.4	—14.1	— 1.4
Lower Lake	8	50.0	— 1.3	—22.6	— 2.3
Upper Lake	10	47.3	+ 0.4	—22.7	— 2.3
North Dakota*	8	47.6	+ 4.0	—18.2	— 1.8
Upper Mississippi Valley	11	54.4	+ 1.7	—19.8	— 2.0
Missouri Valley	11	55.9	+ 3.3	— 5.4	— 0.5
Northern Slope	7	49.7	+ 3.7	+ 7.7	+ 0.8
Middle Slope	6	57.7	+ 2.4	+ 7.3	+ 0.7
Southern Slope*	6	63.4	+ 1.7	+12.1	+ 1.2
Southern Plateau*	13	57.1	— 0.7	+ 2.4	+ 0.2
Middle Plateau*	8	48.2	— 0.6	+ 3.1	+ 0.3
Northern Plateau*	12	50.9	+ 2.6	+21.0	+ 2.1
North Pacific	7	53.8	+ 2.4	+ 2.4	+ 0.2
Middle Pacific	5	60.1	+ 2.0	+ 5.6	+ 0.6
South Pacific	4	65.4	+ 1.9	+10.2	+ 1.0

* Regular Weather Bureau and selected voluntary stations.

In Canada.—Prof. R. F. Stupart says:

The mean of October temperature was higher than the average over western and northwestern Canada from the Pacific coast to the eastern limits of Manitoba, and it was just average or below in Ontario, Quebec, and the Maritime Provinces. The positive departure was almost uniformly 3° or 4° from Winnipeg westward to the mountains, and 1° to 3° in British Columbia. The largest negative departures were 3° or 4° in the more central portions of Ontario, while in other parts of that province and in Quebec and the Maritime Provinces the departure was very generally from 1° to 2° lower than the average.

By geographic districts, the mean temperature was normal in the South Atlantic States; below normal in the New England and Middle Atlantic States, lower Lake and southern and middle Plateau regions; and above normal in the remaining districts.

The mean temperature for the month was lower by 1° than any October since the establishment of the station at Elkins, W. Va., and Richmond, Va.; by 2° at Modena, Utah; and by 3° at Scranton, Pa., and Syracuse, N. Y., all of which are stations having but a few years' record. At Taylor, Tex., the mean for the month was 5° warmer than any previous October mean since the establishment of the station, in November, 1901.

Maximum temperatures of 90°, or higher, occurred generally in the Gulf States, southern and eastern Georgia, western South Carolina, central portions of North Carolina and Virginia, Oklahoma and Indian Territories, southwestern Kansas, southern and western Arizona, and southern California, and of 100°, or higher, in western Arizona and southeastern California.

The maximum for the month was higher by 1° than any reported in October since the establishment of the station at San Diego, Cal., Walla Walla, Wash., and Yankton, S. Dak.; 2° at Meridian, Miss.; 3° at New Orleans, La., and Tampa, Fla.; and 4° at Jupiter, Fla.

Freezing temperatures generally occurred as far south as the northern portions of the Gulf States, southern portion of New Mexico, and central Arizona, and westward to near the coast of Washington and Oregon, and to central California.

Minimum temperatures 1° lower than any previously recorded in October were reported from Eastport and Portland, Me., and Richmond, Va.; 2° at Binghamton, N. Y.; and 3° at Block Island, R. I., and Elkins, W. Va.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The total precipitation for the month was above the average in eastern and central Florida, southeastern South Carolina, northeastern West Virginia, northern Maryland, central New York, upper Michigan, Wisconsin generally, Minnesota, northwestern Iowa, northeastern Nebraska, South Dakota except the south-central portion, southern North Dakota, west-central and southwestern Idaho, eastern and southern Oregon, western Nevada, northern California, New Mexico and the Rio Grande Valley. In all other districts the total amount of precipitation was below the normal. On the eastern coast of Florida the excess in precipitation ranged from +6.5 to +11.8 inches.

By geographic districts the total precipitation was below the average in New England, the middle and South Atlantic and Gulf States, Ohio Valley and Tennessee, Lake Regions, North Dakota, upper Mississippi and Missouri valleys, and the middle and southern slope, northern Pateau, and north Pacific regions; and above the average in all other districts.

The total precipitation for the month was the lowest recorded during any October since the establishment of station at Asheville and Hatteras, N. C., Evansville, Ind., Louisville, Ky., Knoxville, Tenn., Montgomery, Ala., Savannah, Ga., Springfield, Ill., Pueblo, Colo., Oklahoma, Okla., and Port Crescent and North Head, Wash.; and the greatest on record during October at Fort Worth, Tex., Fresno, Cal., Houghton, Mich., and Jupiter, Fla.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 4, 5, 27. Arkansas, 5. California, 9, 11, 14. Colorado, 9. Connecticut, 23. Idaho, 6, 8, 9, 16, 18. Illinois, 5, 7, 10, 20–22. Indiana, 21, 22. Iowa, 4, 5, 22. Kansas, 4, 18, 19. Kentucky, 21, 22. Maine, 12–14, 27. Maryland, 23. Massachusetts, 12. Michigan, 8, 10, 20–23, 25, 26, 28. Minnesota, 3. Montana, 7, 9. Nebraska, 12, 18, 19. Nevada, 5, 6, 8, 10–12. New Hampshire, 6, 12. New Mexico, 6, 7, 29. New York, 1, 2, 12, 13, 22, 23, 26, 27. North Dakota, 15. Ohio, 21–24. Oregon, 8, 16. Pennsylvania, 3, 11, 22, 23, 26. South Dakota, 8, 10. Tennessee, 5. Texas, 18, 30. Utah, 5, 6, 8, 9, 17. Vermont, 11, 12. Washington, 16. West Virginia, 23. Wisconsin, 7, 8, 21, 22. Wyoming, 9.

SLEET.

The following are the dates on which sleet occurred in the respective States:

Colorado, 6, 18. Illinois, 21, 22, 27. Indiana, 22, 23. Iowa, 21, 22. Kansas, 18. Kentucky 21. Maine, 12, 13. Massachusetts, 10, 12, 27. Michigan, 2, 5, 20–23, 25. Minnesota, 16, 20, 21, 24, 25. Montana, 17. Nevada, 8, 15. New Hampshire, 12. New Mexico, 28–30. New York, 12, 23, 24, 26. North Dakota, 6. Ohio, 21–23, 27. Pennsylvania, 22, 23, 26. South Dakota, 4. Texas, 25. Utah, 12, 15, 17. Vermont, 1, 6–8, 14. Virginia, 23. Washington, 15. West Virginia, 21, 23. Wisconsin, 26.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	1.84	47	−2.1	− 2.8
Middle Atlantic	12	2.34	72	−0.9	− 7.8
South Atlantic	10	2.47	66	−1.3	−12.0
Florida Peninsula*	8	7.24	150	+2.4	− 0.9
East Gulf	9	0.29	11	−2.4	−15.5
West Gulf	7	1.24	44	−1.6	− 6.5
Ohio Valley and Tennessee	11	0.86	34	−1.7	− 9.6
Lower Lake	8	2.08	68	−1.0	+ 1.2
Upper Lake	10	2.89	97	−0.1	− 1.8
North Dakota*	8	0.88	51	−0.2	+ 0.3
Upper Mississippi Valley	11	1.88	76	−0.6	− 0.3
Missouri Valley	11	1.11	55	−0.9	+ 0.2
Northern Slope	7	0.89	113	+0.1	0.0
Middle Slope	6	0.51	32	−1.1	+ 2.4
Southern Slope*	6	0.50	25	−1.5	− 0.4
Southern Plateau*	13	1.25	147	+0.4	+ 0.2
Middle Plateau*	8	0.98	126	+0.2	+ 2.8
Northern Plateau*	12	1.06	84	−0.2	− 0.8
North Pacific	7	2.64	58	−1.9	− 4.2
Middle Pacific	5	3.60	176	+1.3	+ 8.8
South Pacific	4	1.27	190	+0.6	+ 1.4

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

A little over an inch of rain fell during the month in Alberta and about half that amount in other parts of the Territories. In Manitoba the fall was somewhat greater, being one and a half inches at Winnipeg and more farther east. In British Columbia the fall was very generally less than average. In Ontario the distribution of rain was very irregular; in New Ontario, including Algoma and Rainy River districts, the average was exceeded, as it also was in a district including the higher lands east of Lake Huron, while in other portions of the Province it was deficient and especially so in the portion extending from the eastern half of Lake Ontario north to the Ottawa. In Quebec and the Maritime Provinces there were no important differences from average.

CLEAR SKY AND CLOUDINESS.

The cloudiness was normal in the upper Mississippi Valley and southern Plateau region; above the normal in the Florida Peninsula, Lake region, North Dakota, Missouri Valley, and the middle and southern slope and Pacific regions; and below the normal in the remaining districts.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.2	− 0.3	Missouri Valley	4.9	+ 0.1
Middle Atlantic	5.5	− 1.3	Northern Slope	5.7	− 0.5
South Atlantic	5.1	− 0.9	Middle Slope	5.3	+ 0.2
Florida Peninsula	4.9	+ 0.2	Southern Slope	4.8	+ 2.0
East Gulf	2.1	− 1.5	Southern Plateau	2.0	0.0
West Gulf	3.3	− 0.3	Middle Plateau	2.5	− 0.7
Ohio Valley and Tennessee	5.5	− 1.0	Northern Plateau	3.9	− 1.2
Lower Lake	6.1	+ 0.3	North Pacific	6.9	+ 1.0
Upper Lake	6.7	+ 0.6	Middle Pacific	4.4	+ 1.2
North Dakota	5.2	+ 0.1	South Pacific	2.9	− 0.1
Upper Mississippi Valley	4.4	0.0			

HUMIDITY.

The relative humidity was normal in the Missouri Valley; below the average in New England, the Middle Atlantic, South Atlantic, and Gulf States, Ohio Valley and Tennessee, and lower Lake, and north and south Pacific regions; and above the average in the remaining districts.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	73	− 6	Missouri Valley	67	0
Middle Atlantic	70	− 6	Northern Slope	66	+ 6
South Atlantic	71	− 7	Middle Slope	65	+ 6
Florida Peninsula	81	+ 1	Southern Slope	68	+ 5
East Gulf	65	− 8	Southern Plateau	48	+ 6
West Gulf	68	− 4	Middle Plateau	57	+13
Ohio Valley and Tennessee	68	− 3	Northern Plateau	64	+ 1
Lower Lake	73	− 1	North Pacific	82	− 2
Upper Lake	81	+ 3	Middle Pacific	76	+ 4
North Dakota	75	+ 3	South Pacific	67	− 3
Upper Mississippi Valley	74	+ 3			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.	12	57	ne.	Point Reyes Light, Cal.	9	56	s.
Do	13	50	ne.	Do	10	56	s.
Do	21	56	se.	Do	11	69	s.
Boston, Mass	21	50	s.	Do	16	51	nw.
Chicago, Ill	4	53	sw.	Portland, Me	21	51	se.
Hatteras, N. C.	21	52	s.	Sand Key, Fla	15	50	ne.
Jupiter, Fla.	16	52	e.	Sioux City, Iowa	16	51	s.
Do	17	68	e.	Do	19	51	nw.
Lexington, Ky	21	50	nw.	Do	21	52	nw.
Lincoln, Nebr	19	50	nw.	Southeast Farallon, Cal.	11	50	s.
Modena, Utah	11	50	w.	Tatoosh Island, Wash.	15	52	s.
New Haven, Conn	21	62	se.	Do	18	56	sw.
New York, N. Y.	1	54	w.	Do	21	55	e.
Do	21	56	se.	Do	24	50	e.
North Head, Wash	10	60	se.	Do	25	52	e.
Do	15	61	se.	Do	29	52	e.
Do	29	54	se.	Do	30	50	sw.
Do	30	80	se.				

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 1227 thunderstorms were received during the current month as against 1770 in 1903 and 3900 during the preceding month. The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 5th, 173; 10th, 125; 4th, 105; 8th, 100. Reports were most numerous from: Iowa, 112; Ohio, 93; Wisconsin, 90.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the dates of full moon, viz, October 20 to 28, inclusive.

In Canada: Thunderstorms were reported from St. Johns, N. B., 26; St. John, N. F., 2; Grand Manan, 1; Toronto, 10; Port Stanley, 10, 21, 22; Saugeen, 21; Winnipeg, 17; Banff, 3; New Westminster, 9; Hamilton, Bermuda, 27, 29, 30.

Auroras were reported from Grand Manan, Charlottetown, Father Point, and Kingston, 7; Quebec, 6, 7, 13; Montreal, 6. Parry Sound, 6, 13; Minnedosa, 6, 7; Swift Current, 13; Edmonton, 7, 8, 29; Prince Albert, 6, 7, 21.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

Table I gives, for about 137 Weather Bureau stations making two observations daily and for about 31 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,800 stations occupied by voluntary and other cooperating observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station, the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions of the wind based on these two observations only and without considering the velocity. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes.....	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates per hour (ins.).....	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages; it is prepared by the Forecast Division.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are prepared by the Forecast Division. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the observations at 8 a. m. and 8 p. m., seventy-fifth meridian time. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest barometric reading at or near the center at that time, and in both cases as reduced to sea level and standard gravity.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all by 0.0.

Chart IV.—Percentage of clear sky. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of clear sky, and the values thus obtained have been used in preparing Chart IV.

Chart V.—Surface temperatures; maximum, minimum, and mean of these. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VI. Isobars and isotherms at 10,000 feet. The mean monthly station pressure for each station has been reduced to the 10,000-foot plane by entering Table 53, pages 789–988, Volume II, Annual Report of the Chief of the Weather Bureau, 1900–1901, with the temperature argument, t, corresponding to θ_2, and correcting the station pressure by the reduction $B_2 - B$ after applying the plateau correction, $C.\ \Delta\theta.\ H$, and the corrections for e and ΔA, the argument t being the mean monthly air temperature. This reduction is fully described in the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II, pages 772 to 786. The reduction for obtaining B_2 may also be found by using gradients from the station pressure to the height of 10,000 feet, as set forth on pages 18 and 19 of the MONTHLY WEATHER REVIEW for January, 1902.

The isotherms on the 10,000-foot plane have been computed by using the gradients for temperature for each month and station as shown by Table 48, Chapter VIII, Volume II, Report of the Chief of the Weather Bureau, 1900–1901.

Chart VII.—Isobars and isotherms at 3500 feet. The pressure and temperature data entered on this chart are found by the method described for similar data on the 10,000 foot plane.

Chart VIII.—Isobars and isotherms at sea-level and resultant surface winds. The pressures have been reduced to sea level and standard gravity by the method described by Prof. Frank H. Bigelow on pages 13–16 of the REVIEW for January, 1902. The pressures have also been reduced to the mean of the twenty-four hours by the application of a suitable correction to the mean of the 8 a. m. and 8 p. m. readings, at stations taking two observations daily, and to the 8 a. m. or 8 p. m. observation, respectively, at stations taking but a single observation. The diurnal corrections so applied will be found in Table 27, Volume II, Annual Report of the Chief of Weather Bureau, 1900–1901, pp. 140–164.

The isotherms on the sea-level plane have been constructed by means of the data summarized in chapter 8 of the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II. The correction $t_0 - t$, or temperature on the sea-level plane minus the station temperature, as given by Table 48 of the above report, is added to the observed surface temperature to obtain the adopted sea-level temperature.

The resultant wind directions are computed from observations at 8 a. m. and 8 p. m. daily. The resultant durations are shown by figures attached to the arrows.

IX.—Isobars at sea-level; surface isotherms; resultant winds.

Chart X.—Hydrographs for seven principal rivers of the United States, prepared by the Forecast Division.

Chart XI.—The total snowfall. This is based on the reports from regular and voluntary observers, and shows the depth of the snowfall during the month in inches. In general, the depth is shown by lines inclosing areas of equal snowfall, but in special cases figures are also given.

Chart XII.—Depth of snow on ground at end of month. When there is no snow the last two charts are omitted.

TABLE I.—*Climatological data for Weather Bureau stations, October, 1904.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
New England.							49.1	— 2.1											73	1.84	— 2.1									5.2	
Eastport	76	69	82	29.94	30.03	+ .03	45.2	— 1.6	68	17	52	23	31	38	27		42	37	77	2.54	— 1.5	12	9,595	nw.	48	s.	21	8	12	11	6.1	T.
Portland, Me.	103	81	117	29.94	30.06	+ .02	46.4	— 2.7	68	16	54	23	31	39	31		42	37	72	1.16	— 2.7	8	7,447	nw.	51	se.	21	14	8	9	4.8	
Concord	298	70	79	29.74	30.07	+ .02	45.8	— 3.7	72	17	56	22	28	36	40		.....	.....	.....	1.60	— 1.9	12	4,248	nw.	30	se.	21	8	15	8	5.5	0.5
Northfield	876	16	60	29.12	30.08	+ .04	41.8	— 1.5	71	10	52	15	31	32	41		38	34	75	2.29	0.0	11	6,570	s.	36	se.	21	5	7	19	7.1	1.4
Boston	125	115	181	29.94	30.08	+ .03	50.6	— 1.3	74	17	59	27	31	42	30		45	39	68	2.13	— 2.2	8	8,089	w.	50	s.	21	12	8	11	5.2	T.
Nantucket	12	43	82	30.05	30.06	+ .01	52.2	— 0.4	68	11	57	36	31	47	18		48	45	78	1.01	— 3.0	8	11,700	n.	48	ne.	12	13	10	8	5.2	
Block Island	26	11	46	30.04	30.07	+ .02	51.5	— 2.1	67	18	57	30	31	46	20		47	42	70	1.86	— 2.6	7	14,375	sw.	57	ne.	12	15	4	12	4.5	
Narragansett	.....	9	38	.....	.....	.....	49.2	— 3.1	70	18	58	25	31	40	31		.....	.....	.....	1.75	— 3.0	7	.....	w.	.....	.....	.....	18	4	9	.....	
New Haven	106	116	154	29.98	30.09	+ .03	50.3	— 2.1	78	18	60	25	31	41	34		45	39	68	2.21	— 1.8	6	7,071	n.	62	se.	21	19	7	5	3.1	
Mid. Atlantic States.							53.8	— 1.7											70	2.34	— 0.9									3.6	
Albany	97	102	115	29.98	30.09	+ .03	48.6	— 2.0	73	18	57	24	31	40	35		43	39	75	3.09	— 0.1	9	5,697	s.	35	se.	21	13	7	11	5.1	T.
Binghamton	875	79	90	29.14	30.09	+ .03	47.1	— 1.0	80	10	57	19	31	37	41		.....	.....	.....	3.31	+ 0.4	10	4,451	w.	28	nw.	1	13	8	10	5.4	0.6
New York	314	108	350	29.76	30.10	+ .04	53.3	— 1.7	78	18	60	33	31	46	27		47	42	70	3.21	— 0.3	5	9,177	w.	56	se.	21	19	6	6	3.5	
Harrisburg	374	94	104	29.72	30.13	+ .05	51.6	— 0.9	84	10	61	29	31	42	33		45	40	69	2.78	— 0.3	5	4,706	nw.	36	nw.	1	19	6	6	3.6	
Philadelphia	117	116	184	29.99	30.12	+ .05	54.4	— 1.4	84	11	63	32	31	46	30		47	41	64	4.03	+ 1.1	3	7,513	n.	35	nw.	21	19	6	6	3.4	
Scranton	805	111	119	29.23	30.11	+ .04	48.9	.....	81	10	59	23	31	38	39		44	40	77	3.80	.....	8	5,385	sw.	36	nw.	1	9	13	9	5.5	
Atlantic City	52	39	48	30.05	30.11	+ .04	54.0	— 2.3	84	11	62	30	28	46	27		49	44	73	1.50	— 1.8	5	6,432	n.	49	s.	21	19	6	6	3.2	
Cape May	17	48	52	30.11	30.13	+ .06	54.6	— 4.3	80	11	62	30	31	48	22		49	.....	.....	1.73	— 1.8	4	6,591	n.	36	se.	21	20	7	4	3.1	
Baltimore	123	69	117	29.98	30.11	+ .03	54.8	— 2.1	86	10	64	31	31	45	35		48	42	67	3.73	+ 0.8	2	5,167	n.	30	nw.	1	18	5	8	3.6	
Washington	112	59	76	30.00	30.12	+ .04	54.1	— 2.1	86	10	65	28	31	43	40		48	44	76	2.35	— 0.7	3	4,274	se.	32	w.	21	21	6	4	2.8	
Cape Henry	18	11	58	30.09	30.11	+ .04	59.8	— 2.0	87	11	66	43	31	54	25		.....	.....	.....	1.99	— 1.8	3	11,349	n.	48	n.	6	23	4	4	3.1	
Lynchburg	681	83	88	29.38	30.14	+ .05	56.2	— 0.9	88	10	70	28	24	43	46		47	43	71	0.40	— 2.9	1	2,312	ne.	23	nw.	21	21	8	2	2.9	
Norfolk	91	102	111	30.02	30.12	+ .05	59.6	— 1.0	86	11	67	43	24	52	31		53	49	75	2.26	— 1.6	4	6,292	ne.	36	nw.	21	23	3	5	2.6	
Richmond	144	82	90	29.98	30.13	+ .05	57.7	.....	87	11	69	33	31	46	39		.....	.....	.....	2.80	.....	3	3,269	n.	18	s.	10	21	6	4	2.7	
Wytheville	2,298	40	47	27.73	30.15	+ .06	51.8	— 1.6	80	10	66	18	24	37	45		42	36	68	0.02	— 2.7	2	3,158	w.	21	w.	22	23	3	5	2.3	T.
S. Atlantic States.							63.1	0.0											71	2.47	— 1.3									3.1	
Asheville	2,255	53	75	27.78	30.12	+ .03	54.4	— 0.2	82	10	68	22	24	40	41		46	40	68	0.02	— 2.8	1	4,259	se.	22	e.	7	20	9	2	2.5	
Charlotte	773	68	76	29.29	30.13	+ .05	60.9	— 0.3	86	11	70	35	24	50	33		50	43	62	0.91	— 2.8	5	4,120	ne.	18	ne.	6	22	6	3	2.5	
Hatteras	11	12	47	30.07	30.08	+ .02	64.6	+ 0.1	81	12	70	50	31	59	18		58	55	75	0.54	— 5.6	4	11,406	ne.	52	s.	21	24	6	1	2.4	
Raleigh	376	71	79	29.72	30.12	+ .05	58.6	+ 0.6	87	11	70	36	25	48	35		50	45	68	2.70	— 0.7	4	4,250	n.	23	n.	6	19	8	4	3.1	
Wilmington	78	82	90	29.99	30.07	+ .01	62.2	— 1.3	85	12	72	39	24	52	26		55	52	79	1.26	— 2.6	6	5,689	ne.	32	nw.	21	17	11	3	2.9	
Charleston	48	14	92	30.02	30.07	+ .01	66.8	+ 0.1	86	2	74	47	24	60	20		59	55	72	4.75	+ 0.6	6	9,449	ne.	33	e.	17	12	16	3	3.9	
Columbia, S. C.	351	167	175	29.71	30.10	+ .03	62.8	— 0.8	88	11	73	39	24	53	27		53	47	64	2.33	— 0.1	4	8,474	ne.	31	ne.	6	19	8	4	3.1	
Augusta	180	89	97	29.89	30.08	+ .01	64.3	+ 0.6	89	11	76	37	23	53	32		55	49	67	0.26	— 2.2	3	4,775	ne.	24	ne.	6	23	5	3	1.8	
Savannah	65	81	89	29.99	30.06	+ .01	66.9	+ 0.5	88	2	75	45	24	59	24		59	55	75	0.23	— 3.4	4	6,310	ne.	28	ne.	18	18	7	6	3.5	
Jacksonville	43	101	129	29.93	29.98	— .04	70.3	+ 0.6	92	2	77	50	24	64	24		65	63	84	11.70	+ 6.5	15	9,202	ne.	37	sw.	3	10	8	13	5.5	
Florida Peninsula.							76.8	+ 1.1											81	3.60	+ 2.4									4.9	
Jupiter	28	10	48	29.86	29.88	— .08	77.0	+ 1.6	94	3	83	61	30	71	20		72	70	83	21.39	+11.8	14	11,207	e.	68	e.	17	6	18	7	5.8	
Key West	22	10	53	29.85	29.87	— .07	78.2	— 0.3	89	3	82	70	30	74	13		72	70	79	1.57	— 3.7	14	8,675	ne.	31	w.	17	10	13	8	5.1	
Sand Key	23	40	71	29.82	29.85	.....	78.0	.....	98	4	81	69	11	75	14		.....	.....	.....	1.02	.....	12	13,478	ne.	50	ne.	15	12	13	6	4.4	
Tampa	34	79	96	29.89	29.93	— .05	75.2	+ 2.1	93	2	83	51	24	67	25		67	65	80	2.84	— 0.9	6	7,562	ne.	33	ne.	16	17	7	7	4.2	
East Gulf States.							67.8	+ 2.0											65	0.29	— 2.4									2.1	
Atlanta	1,174	190	216	28.86	30.10	+ .03	62.9	+ 0.7	85	10	73	39	23	53	29		52	45	59	0.10	— 2.2	1	8,772	e.	36	nw.	21	19	10	2	2.7	
Macon	370	93	99	29.69	30.09	+ .03	65.5	.....	90	11	76	41	30	55	33		.....	.....	.....	0.19	.....	3	5,094	ne.	22	nw.	22	22	6	3	2.2	
Pensacola	56	79	96	29.98	30.04	+ .01	71.9	+ 2.7	94	1	80	50	21	64	24		.....	.....	.....	0.19	— 3.1	3	7,384	ne.	24	e.	7	21	8	2	2.4	
Birmingham	700	136	143	29.33	30.09	+ .02	65.2	+ 0.1	93	2	76	37	23	54	30		.....	.....	.....	0.24	— 2.7	3	5,764	ne.	24	se.	7	25	5	1	1.5	
Mobile	57	88	96	29.58	30.04	.00	70.0	+ 2.6	95	2	80	41	24	60	28		60	55	67	0.29	— 3.1	2	4,932	n.	19	n.	14	23	6	2	2.4	
Montgomery	223	100	112	29.83	30.06	.00	67.4	+ 2.2	95	2	80	37	24	55	33		57	51	65	T.	— 2.4	0	4,741	ne.	27	w.	22	26	5	0	1.8	
Meridian	375	84	93	29.68	30.07	+ .01	64.4	+ 2.2	92	2	78	33	24	51	36		.....	.....	.....	0.22	— 1.4	2	3,306	ne.	19	w.	21	27	4	0	1.3	
Vicksburg	247	62	74	29.78	30.04	— .02	68.1	+ 2.8	93	1	79	42	28	57	29		58	52	67	0.06	— 2.6	1	4,581	e.	20	nw.	20	24	5	2	2.2	
New Orleans	51	88	121	29.98	30.03	.00	72.7	+ 2.9	94	2	80	54	24	66	22		63	58	66	1.20	— 2.0	3	5,918	ne.	28	ne.	6	22	5	4	2.6	
West Gulf States.							69.3	+ 2.2											68	1.24	— 1.6									3.3	
Shreveport	249	77	84	29.80	30.07	+ .02	68.8	+ 3.5	94	1	80	43	29	57	35		57	51	63	0.13	— 3.0	2	4,485	ne.	20	nw.	20	23	6	2	2.6	
Fort Smith	457	79	94	29.59	30.07	+ .02	63.4	+ 2.3	90	1	75	36	27	52	37		54	48	67	1.23	— 1.6	2	5,999	e.	40	nw.	24	20	7	4	2.9	
Little Rock	357	93	100	29.72	30.10	+ .04	64.0	+ 1.7	86	10	74	40	28	54	35		54	48	65	0.69	— 1.8	5	4,571	ne.	40	nw.	5	24	3	4	2.3	
Corpus Christi	20	48	53	30.00	30.02	+ .02	73.4	+ 0.9	87	11	80	52	26	67	27		68	65	79	2.28	+ 0.1	7	6,788	se.	29	n.	19	11	12	8	4.5	
Fort Worth	670	106	114	29.36	30.07	+ .04	68.4	.....	97	3	80	41	28	57	31		.....	.....	.....	5.29	.....	5	6,593	se.	37	w.	18	20	8	3	2.7	
Galveston	54	106	112	29.98	30.04	+ .01	74.6	+ 2.3	90	1	80	58	21	70	24		67	63	72	0.80	— 3.4	3	8,444	e.	33	n.	19	20	7	4	3.0	
Palestine	510	73	79	29.52	30.05	+ .02	69.6	+ 3.1	94	4	80	45	29	59	35		59	53	66	0.68	— 2.5	4	4,854	ne.	22	nw.	19	19	7	5	3.4	
San Antonio	701	80	91	29.30	30.02	+ .01	71.0	+ 1.3	93	1	82	46	22	60	37		61	55	67	2.86	+ 1.2	6	4,335	se.	26	nw.	25	17	10	4	3.6	
Taylor	583	55	63	29.43	30.04	+ .02	69.7	.....	95	2	82	42	20	58	40		.....	.....	.....	4.30	.....	5	5,191	se.	25	nw.	18	11	13	7	4.7	
Ohio Val. and Tenn.							62.0	+ 0.4											68	0.86	— 1.7									3.6	
Chattanooga	762	106	112	29.32	30.14	+ .05	60.4	— 0.1	86	10	73	33	24	48	36		51	44	64	0.46	— 2.2	4	4,280	ne.	32	nw.	5	21	8	2	2.7	
Knoxville	1,004	35	88	29.05	30.12	+ .03	58.6	+ 1.0	85	10	72	31	24	46	37		50	44	69	0.07	— 2.7	3	4,558	n.	27	w.	22	21	8	7	2.7	
Memphis	397	146	154	29.60	30.12	+ .05	62.9	+ 1.3	85	9	73	40	23	53	29		55	50	70	0.31	— 2.5	2	6,745	ne.	32	sw.	21	26	3	2	1.4	
Nashville	546	122	134	29.54	30.13	+ .05	60.4	+ 0.8	88	10	72	34	28	48	38		51	44	65	0.29	— 2.2	3	4,362	ne.	26	sw.	21	22	8	1	1.9	
Lexington	989	75	102	29.05	30.13	+ .05	57.0	+ 1.2	84	10	67	35	27	47	35		.....	.....	.....	0.57	— 1.6	3	7,023	ne.	50	nw.	21	22	9	0	2.2	
Louisville	525	114	136	29.55	30.14	+ .06	58.5	+ 0.8	86	10	70	33	28	47	36		49	44	69	0.27	— 2.5	2	5,607	n.	41	w.	21	17	10	4	3.6	
Evansville	431	72	82	29.65	30.12	+ .04	58.0	.....	82	10	68	34	28	48	33		.....	.....	.....	0.25	.....	5	4,189	ne.	30	w.	21	19	8	4	2.7	
Indianapolis	822	154	164	29.22	30.12	+ .05	54.2	— 0.2	80	9	64	30	28	44	30		47	41	68	1.04	— 1.8	8	6,648	s.	39	w.	21	15	7	9	4.3	
Cincinnati	628	152	160	29.44	30.12	+ .04	56.7	+ 0.3	85	10	67	32	28	46	34		48	42	64	0.89	— 1.6	3	4,844	sw.	31	w.	21	17	8	6	3.7	
Columbus	824	173	190	29.23	30.12	+ .04	54.0	+ 0.3	84	10	65	30	31	43	33		45	40	69	0.97	— 1.7	8	7,985	sw.	49	sw.	21	13	11	7	4.7	T.
Pittsburg	842	336	352	29.20	30.11	+ .03	54.6	— 0.1	82	10	65	30	31	45	31		47	40	64	2.09	— 0.3	10	6,877	nw.	36	sw.	10	10	15	6	4.9	T.
Parkersburg	638	77	84	29.45	30.15	+ .07	55.6	+ 0.5	86	10	68	27	31	44	40		46	42	70	1.16	— 1.0	4	3,789	n.	26	nw.	20	7	16	8	5.5	
Elkins	1,940	41	50	28.07	30.14	+ .04	49.5	— 1.2	84	19	65	19	28	34	49		41	38	78	2.16	+ 0.2	9	2,561	n.	26	w.	22	12	8	11	4.6	0.2
Lower Lake Region.							50.0	— 1.3											73	2.08	— 1.0									6.1	
Buffalo	767	178	206	29.23	30.08	+ .03	48.6	— 1.7	76	19	55	26	31	42	27		44	39	72	1.93	— 1.7	12	11,221	sw.	48	sw.	22	4	7	20	7.5	T.
Oswego	335	76	91	29.70	30.07	+ .02	47.1	— 2.9	77	10	54	25	31	40	28		43	38	73	3.69	+ 0.4	14	8,346	s.	33	nw.	1	8	13	10	6.0	0.5
Rochester	523	81	102	29.51	30.09	+ .04	48.2	— 1.4	77	19	56	25	31	40	33		42	38	74	2.02	— 0.9	13	6,265	sw.	31	nw.	1	8	8	15	6.5	0.2
Syracuse	597	97	113	29.42	30.07	+ .01	47.0	.....	79	10	54	23	31	40	28		.....	.....	.....	2.26	.....	13	9,085	s.	48	w.	1	8	10	13	6.2	0.6
Erie	713	92	102	29.30	30.08	+ .03	51.0	— 1.2	76	10	57	30	31	45	25		45	40	71	4.49	+ 0.4	13	8,215	s.	31	sw.	10	8	6	17	6.3	
Cleveland	762	190	201	29.27	30.10	+ .04	51.2	— 1.0	80	10	58	28	31	44	30		46	42	75	1.24	— 1.6	13	11,303	se.	46	s.	21	8	6	17	6.5	T.
Sandusky	629	62	70	29.41	30.10	+ .04	52.1	— 1.1	81	10	60	32	31	45	28		.....	.....	.....	1.22	— 1.5	8	5,963	sw.	28	w.	22	10	11	10	5.3	T.
Toledo	628	120	127	29.41	30.10	+ .05	51.8	— 0.3	79	10	60	29	27	43	28		45	41	73	1.22	— 1.2	7	6,810	sw.	32	s.	24	15	7	9	4.8	
Detroit	730	153	193	29.28	30.08	+ .03	50.4	— 0.6	77	10	58	29	27	43	25		45	41	75	0.86	— 1.7	12	7,811	sw.	42	s.	24	8	9	14	5.7	
Upper Lakes Region.							47.3	+ 0.4											81	2.89	— 0.1									6.7	
Alpena	609	63	80	29.38	30.06	+ .03	44.8	— 0.4	77	17	52	24	7	37	33		41	39	84	1.65	— 2.2	11	7,333	nw.	36	se.	24	7	15	9	5.8	1.2
Escanaba	612	40	48	29.37	30.04	+ .03	45.3	+ 0.6	76	17	52	25	27	39	22		42	39	82	3.56	+ 0.2	12	5,657	s.	24	se.	24	4	6	21	7.5	T.
Grand Rapids	707	127	165	29.30	30.07	+ .04	49.8	— 1.0	75	18	58	32	30	42	25		45	42	82	2.32	— 0.3	12	7,282	s.	35	sw.	10	8	8	15	6.3	T.
Houghton	668	66	74	29.29	30.02	+ .02	45.0	.....	74	16	50	28	30	40	23		.....	.....	.....	5.69	.....	15	4,848	e.	29	w.	9	5	9	17	7.4	2.6
Marquette	734	76	116	29.22	30.04	+ .03	45.0	— 0.1	74	17	51	27	27	39	23		41	38	81	3.57	+ 0.3	17	7,939	nw.	42	w.	10	2	12	17	7.4	0.4
Port Huron	638	70	120	29.40	30.10	+ .06	48.0	— 0.9	76	18	56	29	31	40	27		43	40	79	1.89	— 0.9	7	8,154	sw.	36	s.	24	6	14	11	6.1	T.
Sault Ste. Marie	614	40	61	29.34	30.02	+ .01	43.2	+ 0.5	71	17	50	24	30	36	23		40	37	84	3.92	+ 0.4	16	6,526	nw.	34	nw.	5	6	10	15	6.6	1.0
Chicago	823	241	274	29.19	30.09	+ .05	53.4	+ 1.4	78	10	60	34	27	47	23		47	42	72	1.58	— 1.4	10	12,696	sw.	53	sw.	4	10	13	8	5.0	T.
Milwaukee	681	124	142	29.33	30.07	+ .04	51.8	+ 2.6	77	18	58	29	27	45	26		46	43	77	2.56	+ 0.2	10	7,840	w.	41	sw.	10	6	7	18	6.9	T.
Green Bay	617	49	86	29.38	30.04	+ .02	48.0	+ 1.1	76	17	55	28	27	41	27		43	40	80	3.19	+ 0.5	14	7,042	sw.	37	sw.	24	6	6	19	7.2	T.
Duluth	1,133	11	47	28.80	30.03	+ .03	43.8	0.0	68	1	50	26	6	38	26		40	38	86	4.66	+ 2.1	13	9,746	nw.	39	nw.	22	4	7	20	7.5	1.0

TABLE I.—*Climatological data for Weather Bureau stations, October, 1904*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
North Dakota.							47.4	+ 4.0											75	1.17	— 0.2								5.2	
Moorhead	935	54	60	29.00	30.03	+ .03	47.2	+ 4.1	72	1	56	24	25	38	37	42	40	85	2.04	+ 0.1	8	6,788	se.	32	nw.	21	6	9	16	6.5	T.
Bismarck	1,674	16	29	28.22	30.02	+ .03	49.0	+ 5.2	86	1	61	25	26	37	41	41	36	70	1.24	+ 0.2	4	7,765	nw.	39	nw.	21	12	10	9	4.9	
Williston	1,875	14	44	28.00	30.01	+ .03	45.9	+ 2.7	81	1	60	15	26	32	48	38	32	69	0.23	— 0.8	5	6,471	nw.	44	nw.	23	17	6	8	4.1	T.
Upper Miss. Valley.							54.4	+ 1.7											74	1.88	— 0.6								4.4	
Minneapolis		99	208				48.8	+ 0.9	76	1	56	29	27	42	26					4.94	+ 3.1	14	10,407	se.	42	nw.	21	8	4	19		T.
St. Paul	837	171	179	29.11	30.02	+ .01	49.7	+ 2.6	75	1	56	29	27	43	26	44	41	76	5.05	+ 3.2	11	8,340	nw.	42	nw.	21	9	7	15	6.0	T.
La Crosse	714	71	87	29.27	30.05	+ .03	51.6	+ 2.1	79	9	60	27	27	44	30				2.17	— 0.1	9	5,525	s.	29	n.	21	8	8	15	6.2	T.
Davenport	606	71	79	29.40	30.05	+ .01	54.4	+ 2.3	81	9	64	30	27	45	33	49	46	80	1.15	— 1.5	5	5,488	sw.	34	nw.	21	16	10	5	3.8	
Des Moines	861	84	99	29.15	30.08	+ .05	54.6	+ 2.4	86	4	65	28	27	44	33	48	44	74	1.50	— 1.5	10	6,362	sw.	34	nw.	21	10	11	10	5.1	
Dubuque	698	100	117	29.31	30.07	+ .03	52.8	+ 2.2	80	9	61	29	27	44	32	46	41	72	3.18	+ 0.5	10	4,702	s.	29	nw.	21	6	13	12	6.2	
Keokuk	614	63	78	29.40	30.06	+ .01	56.4	+ 2.3	82	9	66	32	27	47	29	49	45	75	0.30	— 2.5	2	5,986	sw.	40	nw.	21	14	12	5	3.4	
Cairo	356	87	93	29.73	30.12	+ .05	59.0	+ 0.3	83	10	69	36	23	49	30	52	49	79	1.20	— 1.6	5	5,287	ne.	28	n.	5	17	8	6	3.5	
Springfield, Ill	644	82	93	29.41	30.10	+ .05	55.6	+ 0.6	84	10	66	30	27	45	33	47	42	69	0.11	— 2.6	3	6,656	s.	40	w.	21	16	10	5	3.6	
Hannibal	534	75	109	29.51	30.08	+ .03	56.7	+ 1.7	84	10	67	30	28	46	37				0.61	— 0.8	4	6,666	sw.	38	nw.	21	19	9	3	2.9	
St. Louis	567	208	217	29.48	30.09	+ .03	58.7	+ 1.2	84	10	68	36	26	50	26	52	47	70	0.50	— 2.4	3	7,186	s.	43	nw.	21	20	9	2	2.8	
Missouri Valley.							55.9	+ 3.3											67	1.11	— 0.9								4.0	
Columbia, Mo	784	11	84	29.25	30.08	+ .03	57.1	— 0.5	85	10	69	28	23	46	38					1.36	— 0.7	4	5,694	s.	39	nw.	21	21	8	2	2.6	
Kansas City	963	78	95	29.08	30.12	+ .08	59.4	+ 3.7	84	4	70	34	27	49	27	51	45	69	1.00	— 2.4	3	6,117	se.	31	nw.	21	18	9	4	3.3	
Springfield, Mo	1,324	98	104	28.70	30.10	+ .05	59.0	+ 3.0	85	10	69	33	23	49	28	50	43	65	0.97	— 2.1	6	7,705	se.	37	nw.	19	24	5	2	2.3	
Topeka		85	89				59.0	+ 3.0	86	4	71	30	25	47	39				0.22	— 1.8	6	6,631	s.	37	sw.	9	16	9	6	3.9	
Lincoln	1,189	75	84	28.77	30.03	.00	56.6	+ 2.5	87	4	67	31	27	46	39	49	44	70	1.33	— 0.7	7	7,990	s.	50	nw.	19	14	5	12	4.7	
Omaha	1,105	115	121	28.86	30.05	+ .02	56.6	+ 3.7	87	4	66	32	27	47	32	49	44	68	1.40	— 1.1	9	6,570	s.	40	n.	19	12	6	13	5.4	
Valentine	2,598	47	54	27.32	30.04	+ .03	52.7	+ 3.5	86	3	67	20	25	39	47	43	37	66	0.54	— 0.4	2	9,050	nw.	48	nw.	16	17	10	4	3.4	
Sioux City	1,135	96	164	28.81	30.03	+ .01	53.5	+ 2.5	84	3	64	30	23	44	36				2.39	+ 0.7	6	10,545	nw.	52	nw.	21	14	8	9	4.5	
Pierre	1,572	43	50	28.35	30.03	+ .02	55.1	+ 5.7	84	15	68	28	25	42	46	44	37	62	0.16	— 0.5	1	5,271	nw.	36	sw.	16	13	11	7	4.5	
Huron	1,306	56	67	28.63	30.04	+ .03	51.8	+ 5.3	86	7	64	22	27	39	44	43	38	69	1.71	+ 0.4	3	10,303	se.	42	se.	13	11	11	9	4.7	
Yankton	1,233	42	49	28.69	30.01	.00	54.1	+ 4.4	90	3	66	24	27	43	47				3.58	+ 2.1	7	6,352	se.	34	nw.	19	11	10	10	5.0	
Northern Slope.							49.7	+ 3.7											66	0.89	+ 0.1								3.7	
Havre	2,505	11	44	27.37	30.02	+ .04	48.2	+ 4.2	82	1	64	22	28	33	48	40	36	71	0.51	— 0.1	2	5,370	w.	34	sw.	18	18	7	6	3.6	
Miles City	2,371	42	50	27.47	30.00	.00	51.4	+ 5.3	84	2	66	22	25	37	48	44	41	77	0.00	— 0.9	0	4,223	nw.	36	nw.	16	19	8	4	3.6	
Helena	4,110	8	56	25.87	30.08	+ .05	48.6	+ 3.4	76	1	60	25	18	38	32	39	31	57	0.27	— 0.6	3	5,190	w.	36	w.	19	11	14	6	4.4	0.3
Kalispell	2,965	45	51	26.98	30.06	+ .05	45.3	.....	78	2	57	24	27	34	36	39	34	71	0.43	.....	5	3,602	w.	22	sw.	15	18	9	4	3.6	
Rapid City	3,234	46	50	26.62	30.00	— .01	52.0	+ 3.0	82	3	64	23	25	40	37	43	35	60	1.18	+ 0.5	6	6,299	nw.	34	w.	16	18	7	6	3.7	0.1
Cheyenne	6,088	56	64	24.08	30.09	+ .08	46.8	+ 1.9	74	4	60	19	25	34	38	36	26	53	0.57	— 0.2	3	7,580	nw.	48	w.	16	17	8	6	3.3	3.2
Lander	5,372	26	36	24.72	30.12	+ .08	46.2	+ 2.7	76	4	62	14	18	31	41	38	32	71	1.81	+ 0.8	3	2,100	ne.	24	sw.	16	17	11	3	3.1	5.2
Yellowstone Park	6,200	11	47	23.96	30.10	+ .08	44.0	.....	68	1	56	17	18	32	36	36	29	63	0.67	.....	7	5,284	sw.	32	w.	15	15	10	6	4.0	2.8
North Platte	2,821	43	52	27.14	30.07	+ .05	55.0	+ 5.2	89	4	69	22	25	40	43	45	40	70	1.92	+ 0.9	5	6,626	w.	36	se.	12	13	15	3	4.0	
Middle Slope.							57.7	+ 2.4											65	0.51	— 1.1								3.3	
Denver	5,291	79	151	24.80	30.08	+ .07	52.1	+ 1.6	80	4	66	25	19	38	40	42	35	62	0.40	— 0.5	2	5,239	s.	36	w.	16	21	6	4	2.7	2.0
Pueblo	4,685	80	86	25.36	30.06	+ .07	52.7	+ 0.5	81	7	67	25	20	38	42	47	35	59	0.14	— 0.6	3	4,239	nw.	40	ne.	18	23	6	2	2.4	T.
Concordia	1,398	42	47	28.59	30.07	+ .04	58.5	+ 4.0	87	4	70	26	27	47	42	49	45	72	1.76	— 0.4	6	4,821	s.	30	nw.	19	13	9	9	4.5	
Dodge	2,509	44	54	27.47	30.08	+ .06	58.2	+ 3.1	87	4	71	26	25	46	39	49	44	72	0.37	— 0.9	2	8,472	s.	40	se.	12	17	9	5	3.6	
Wichita	1,358	78	86	28.66	30.10	+ .07	61.0	+ 3.4	89	4	73	31	27	49	38	51	45	65	0.35	— 2.0	6	6,392	s.	33	nw.	19	19	8	4	3.5	
Oklahoma	1,214	79	86	28.78	30.06	+ .03	63.5	+ 1.5	90	2	75	34	28	52	38	53	45	60	0.05	— 2.0	3	7,687	se.	35	n.	24	17	9	5	3.3	
Southern Slope.							62.2	+ 1.9											68	0.75	— 1.2								4.8	
Abilene	1,738	45	54	28.27	30.06	+ .05	66.7	+ 2.2	91	2	78	40	26	56	32	56	50	64	1.06	— 1.3	4	5,067	se.	25	se.	9	15	9	7	4.2	
Amarillo	3,676	10	49	26.34	30.06	+ .06	57.8	+ 1.6	85	3	69	29	26	47	32	49	44	71	0.44	— 1.2	3	9,047	se.	49	se.	12	10	13	8	5.5	
Southern Plateau.							59.9	— 0.6											48	0.94	+ 0.1								2.0	
El Paso	3,762	10	110	26.25	30.01	+ .09	62.8	— 0.2	87	5	73	38	21	52	34	52	47	66	3.51	+ 2.6	10	6,353	ne.	30	e.	24	13	12	6	4.3	
Santa Fe	7,013	33	39	23.33	30.05	+ .09	48.8	— 1.0	70	4	59	24	26	38	29	39	33	61	1.70	+ 0.7	4	4,762	ne.	25	se.	8	21	9	1	2.3	
Flagstaff	6,907	12	25	23.40	29.99	+ .07	45.1	— 3.4	72	3	60	18	30	30	43	34	22	48	0.34	— 1.6	3	5,735	e.	32	sw.	15	23	8	0	1.5	T.
Phoenix	1,108	50	56	28.75	29.90	+ .02	70.8	+ 1.0	99	4	86	44	19	56	39	53	38	35	T.	— 0.4	0	2,969	e.	18	w.	8	27	4	0	1.0	
Yuma	141	16	46	29.74	29.89	+ .02	72.6	— 0.2	98	3	87	51	28	58	38	56	42	41	T.	— 0.3	0	4,124	n.	38	n.	17	29	2	0	0.5	
Independence	3,910	51	58	26.03	30.00	+ .05	59.2	+ 0.5	82	4	72	39	18	47	30	45	30	37	0.06	— 0.3	3	5,193	nw.	36	nw.	11	23	6	2	2.1	
Middle Plateau.							50.5	+ 0.2											57	0.98	+ 0.2								2.5	
Carson City	4,720	82	92	25.34	30.07	+ .08	48.6	— 1.0	80	4	64	20	17	33	41	40	33	62	0.79	+ 0.4	6	3,588	s.	36	w.	14	20	4	7	3.0	
Winnemucca	4,344	18	56	25.69	30.10	+ .05	49.5	+ 1.3	80	5	65	23	31	34	45	41	36	71	1.95	+ 1.5	10	3,787	ne.	26	nw.	16	20	4	7	3.0	T.
Modena	5,479	10	43	24.68	30.04	+ .08	47.9	— 0.6	79	4	64	18	19	32	40	37	27	51	0.50	0.0	5	6,891	w.	50	w.	11	22	9	0	1.8	
Salt Lake City	4,366	105	110	25.69	30.07	+ .06	53.1	+ 0.8	83	5	64	28	18	42	33	43	34	53	1.18	— 0.4	8	4,025	se.	29	sw.	15	20	5	6	2.8	0.3
Grand Junction	4,608	43	51	25.46	30.05	+ .06	53.3	+ 0.5	82	5	67	29	19	39	35	41	31	48	0.49	— 0.7	4	3,515	se.	26	sw.	12	25	3	3	2.1	
Northern Plateau.							53.0	+ 3.0											64	1.30	0.0								3.9	
Baker City	3,471	53	59	26.50	30.10	+ .02	50.4	+ 2.3	80	2	62	30	19	39	37	42	35	63	1.87	+ 0.8	8	3,998	se.	21	se.	11	13	7	11	4.6	
Boise	2,739	61	68	27.23	30.10	+ .04	55.1	+ 5.7	86	5	67	34	17	43	40	46	39	63	1.53	+ 0.5	8	2,636	nw.	26	sw.	7	18	5	8	3.8	
Lewiston	757	10	51	29.24	30.05	— .02	55.1	+ 2.3	84	1	66	35	28	44	33				1.40	+ 0.1	8	2,336	e	28	w.	16	13	4	8	3.6	
Pocatello	4,482	46	54	25.56	30.09	+ .05	50.6	+ 2.6	80	5	63	25	18	38	39	42	35	64	0.83	— 0.2	5	5,602	e.	31	sw.	12	21	7	3	2.7	1.8
Spokane	1,929	101	110	28.02	30.08	+ .02	50.8	+ 2.8	82	1	62	30	28	40	37	44	38	65	0.77	— 0.8	9	3,527	ne.	24	sw.	16	11	8	12	5.5	
Walla Walla	1,000	71	79	28.97	30.05	— .02	56.3	+ 2.3	87	1	66	38	29	46	34	50	44	67	1.39	— 0.1	11	3,555	s.	30	s.	11	21	6	4	3.4	
N. Pac. Coast Reg.							53.8	+ 2.4											82	2.64	— 1.9								6.9	
North Head	211	11	56	29.80	30.02	— .03	54.8	+ 1.4	80	21	59	45	16	50	26	52	50	87	1.90	— 3.5	11	10,700	se.	80	se.	30	5	7	19	7.3	
Port Crescent	259	12	29	29.73	30.02	.00	48.8	+ 1.2	63	25	55	34	23	42	23				1.36	— 2.3	11	3,547	se.	16	se.	10	3	10	18	7.1	
Seattle	123	114	151	29.93	30.06	+ .01	54.2	+ 2.7	68	9	60	43	25	49	21	50	47	81	2.32	— 0.7	11	2,070	se.	20	e.	29	4	15	12	6.6	
Tacoma	213	113	120	29.81	30.04	.00	53.6	+ 3.0	72	1	60	38	25	47	31				1.27	— 2.7	9	3,349	n.	31	sw.	30	2	12	17	7.2	
Tatoosh Island	86	7	57	29.90	29.99	— .02	52.6	+ 2.2	62	5	56	46	27	49	14	50	49	89	6.02	— 2.5	18	11,155	e.	56	sw.	18	4	3	24	8.4	
Portland, Oreg	154	68	96	29.87	30.02	— .04	56.5	+ 3.1	80	1	65	40	27	48	27	51	47	75	2.29	— 1.8	7	3,192	nw.	22	sw.	30	10	7	14	5.9	
Roseburg	518	56	60	29.48	30.04	— .04	56.1	+ 3.4	85	1	66	40	17	46	37	51	47	78	3.30	+ 0.5	11	1,870	e.	15	sw.	10	9	10	12	5.6	
Mid. Pac. Coast Reg.							60.1	+ 2.0											76	3.00	+ 1.3								4.4	
Eureka	62	62	80	29.98	30.05	— .01	55.2	+ 3.1	75	20	60	41	17	50	25	52	50	84	2.67	— 0.2	11	3,568	nw.	33	n.	16	7	8	16	6.4	
Mount Tamalpais	2,375	11	18	27.57	30.04	+ .03	59.0	.....	78	4	64	43	15	54	20	53	49	75	3.77	.....	9	10,836	nw.	49	sw.	11	18	7	6	3.2	
Red Bluff	332	50	56	29.65	30.01	— .02	63.1	— 0.4	89	3	74	44	15	53	33	55	50	69	3.53	+ 2.2	8	3,775	se.	25	se.	11	21	4	6	2.8	
Sacramento	69	106	117	29.93	30.00	+ .01	62.5	+ 0.7	86	4	72	45	26	53	31	56	52	74	1.86	+ 1.0	7	4,835	se.	38	se.	9	23	3	5	2.4	
San Francisco	155	161	167	29.88	30.05	+ .04	62.0	+ 2.7	79	20	68	52	31	56	23	56	54	80	2.37	+ 1.2	7	5,506	w.	32	w.	4	18	5	8	3.9	
Point Reyes Light	490	7	50	.....	.....	.....	57.8	+ 3.7	80	20	62	50	8	54	24				4.58	+ 2.3	8	12,961	nw.	69	s.	11	10	7	14	6.0	
Southeast Farallon	30	9	17	30.00	30.03	.....	58.4	.....	76	20	61	53	24	56	17	...	...	...	2.01	.....	7	10,791	nw.	50	s.	11	10	5	16	6.1	
S. Pac. Coast Reg.							65.4	+ 1.9											67	1.27	+ 0.6								2.9	
Fresno	330	67	70	29.64	30.00	+ .04	63.4	— 1.5	88	3	75	41	17	52	33	56	50	67	3.21	+ 2.7	4	3,041	nw.	22	e.	5	23	6	2	2.5	
Los Angeles	338	116	123	29.60	29.96	+ .01	67.6	+ 3.9	93	22	79	48	18	56	37	56	47	60	0.69	0.0	3	3,770	w.	22	sw.	21	21	6	4	2.7	
San Diego	87	94	102	29.84	29.93	— .02	66.8	+ 3.6	94	21	74	53	31	59	31	58	51	68	0.17	— 0.2	3	4,171	nw.	20	nw.	10	27	1	3	1.8	
San Luis Obispo	201	47	54	29.78	29.99	.00	63.7	+ 1.7	91	22	74	46	30	54	40	56	51	73	1.00	0.0	6	4,057	n.	24	ne.	18	12	8	11	4.6	
West Indies.																														
Basseterre	29	41	54	29.85	29.88	— .02	79.6	.....	87	22	85	70	22	74	17	75	72	79	3.34	.....	16	5,128	e.	22	e.	7	3	20	8	6.4	
Bridgetown	30	57	65	29.85	29.88	.00	79.5	+ 1.1	87	31	85	70	8	74	14	75	73	81	6.70	— 0.9	10	4,933	e.	24	se.	8	13	11	7	4.8	
Cienfuegos	52	62	67	29.78	29.83	— .05	77.8	.....	91	5	85	64	31	70	21	72	71	87	11.28	.....	13	5,541	ne.	36	sw.	18	6	12	13	6.3	
Grand Turk	11	6	20	29.85	29.86	— .05	81.3	.....	91	2	88	69	1	75	19				6.51	.....	8	.....	se.	42	se.	13	15	9	7	5.1	
Havana	57	87	105	29.79	29.85	— .05	77.2	— 0.9	87	3	82	61	31	72	20				5.14	— 2.3	12	8,289	ne.	37	e.	9	15	7	9	4.3	
Puerto Principe	352	55	62	29.50	29.86	— .02	76.9	.....	89	2	85	62	31	69	22	72	71	91	11.54	.....	12	5,091	ne.	30	s.	16	9	16	6	5.0	
San Juan	82	48	90	29.79	29.87	— .03	79.3	— 1.1	89	16	85	71	22	74	14	74	72	80	3.55	— 2.6	10	5,955	se.	30	se.	9	9	13	9	5.5	
Santiago de Cuba	82	46	52	29.76	29.84	— .04	78.8	.....	89	7	86	69	23	72	18	73	72	84	6.90	.....	18	6,120	n.	39	se.	15	4	11	16	7.2	

* More than one date.

TABLE II.—*Climatological record of voluntary and other cooperating observers, October, 1904.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Anniston	93	25	59.1	0.65	
Ashville	87	26	60.0	0.81	
Benton				T.	
Bermuda	97	32	67.6	1.33	
Boligee	99	29	65.2	0.31	
Bridgeport				0.10	
Burkeville				T.	
Calera				0.37	
Camphill	98	33	67.4	0.00	
Cedar Bluff				0.69	
Citronelle	95	43	70.4	2.03	
Clanton	100	38	65.4	0.02	
Cordova	94	25	61.8	0.55	
Dadeville				T.	
Daphne	95	44	71.4	0.35	
Decatur	90	34	62.6	0.30	
Delmar	92	35	65.8	0.00	
Demopolis				0.02	
Eufaula	93	33	66.0	0.10	
Evergreen	98	32[e]	65.4	T.	
Flomaton	98	33	68.2	1.76	
Florence *a*				0.20	
Florence *b*	89	29	62.1	0.10	
Fort Deposit	93	38	67.6	0.00	
Gadsden	90	29	63.3	0.70	
Goodwater	94	30	63.2	0.06	
Greensboro	95	37	66.5	0.08	
Greenville				0.00	
Hamilton	93	25	62.0	0.55	
Highland Home	95	41	68.2	0.00	
Letohatchie				0.00	
Livingston	94	30	64.2	0.63	
Lock No. 4	93	28	62.8	0.78	
Lucy	95	30	67.8	T.	
Madison Station	93	30	64.6	0.20	
Maplegrove	89	27	60.2	0.74	
Marion	96	36	66.6	T.	
Milstead				T.	
Newbern	101	31	68.2	T.	
Notasulga				0.00	
Oneonto	90	26	60.6	0.38	
Opelika	95	43	66.6	0.00	
Ozark	96	38	68.6	T.	
Prattville	96	27	64.0	0.00	
Pushmataha	94	30	64.8	0.13	
Riverton	91	27	61.2	0.20	
Scottsboro	88	26	59.4	1.11	
Selma	98	33	68.2	T.	
Spring Hill	91	42	69.1	1.17	
Talladega	95	30	65.2	1.00	
Tallassee				0.00	
Thomasville	97	38	67.3	0.10	
Tuscaloosa	97	32	64.5	T.	
Tuscumbia	88	34	61.0	0.33	
Tuskegee	97	38	69.8	0.12	
Union Springs	94	38	66.4	T.	
Uniontown	97	28	66.0	T.	
Valleyhead	87	25	59.6	1.52	
Verbena				0.00	
Wetumpka	96	29	66.7	0.00	
Alaska.					
Copper Center	55	0	30.5	0.48	3.2
Fort Liscum	57	21	37.6	9.16	4.0
Juneau	66	29	47.6	9.34	
Ketchemstock	51	−10	22.4	0.30	1.0
Killisnoo	57	29	41.8	8.20	
Loring	67	28	45.8	26.01	
Orca	53	30	40.4	27.76	1.0
Sitka	59	33	46.4	10.38	
Skagway	61	24	43.3	5.35	
Tanana	48	− 8	18.0	0.15	1.5
Teikhill	50	9	31.1	2.82	7.6
Arizona.					
Allaire Ranch				0.60	
Alpine				3.94	T.
Arizona Canal Co. Dam	100	45	73.2	0.00	
Aztec	107	46	75.9	0.00	
Benson	93[f]	35[f]	66.3[f]	1.15	
Bisbee	82	37	59.3	1.34	
Blue	80	24	53.6	2.83	T.
Bowie	90	35	62.0	2.15	
Buckeye	101	37	67.7	0.28	
Casagrande	96	34	66.2	0.00	
Cochise *1	91	43	69.8	0.50	
Congress	91	48	68.9	0.00	
Douglas	92	35	64.3	1.49	
Dragoon *1	83	49	66.2	0.00	
Dudleyville	94	35	65.6	0.01	
Duncan	90	25	60.2	2.53	
Fort Apache	80	20	54.0	1.35	
Fort Defiance	70	19	43.3	0.20	
Fort Grant	94	41	64.8	0.31	
Fort Huachuca	83	38	61.2	1.50	
Fort Mohave	102	43	71.0	T.	
Gilabend	100	40	71.6	0.00	
Grand Canyon	80	25	50.8	0.00	
Greaterville	83	36	60.0	3.00	
Greer				2.59	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Holbrook	87	18	53.8	0.19	
Huachuca Reservoir				3.40	
Jerome	85	39	62.1	T.	
Kingman	96	37	63.2	0.06	
Maricopa	98	41	69.7	T.	
Mesa	101	40	70.5	0.15	
Mohawk Summit *1	109	09	76.4	0.09	
Natural Bridge				0.00	
Oracle	88	41	63.1	0.12	
Oro				1.17	
Parker	104	34	70.2	0.00	
Phoenix	99	34	68.8	0.00	
Pinal Ranch				0.35	
St. Johns	85	17	52.8	0.35	
San Carlos	98	34	66.4	0.14	
San Simon	90	30	61.2	1.30	
Sentinel *1	102	32	69.0	0.00	
Signal	100[f]	35[f]	68.3[f]	0.02	
Superstition				T.	
Taylor	86	17	55.9	0.25	
Thatcher	94	32	63.0	0.85	
Tombstone	84	38	61.0	1.53	
Tuba	81	18	50.2	0.30	
Tucson	97	35	68.4	0.04	
Upper San Pedro	91	29	60.5	0.50	
Vail *5	96	54	71.0	0.04	
Walnutgrove				0.05	
Wilcox	88	29	59.5	0.61	
Williams	79	21	50.7	0.60	
Yarnell				0.28	
Young	95	21	57.4	0.48	
Arkansas.					
Amity	94	30	63.8	1.78	
Arkadelphia	93	32	63.8	1.00	
Arkansas City				0.50	
Batesville	89	32	60.8	1.39	
Beebranch	86	29	61.8	0.30	
Black Rock				0.80	
Blanchard	95	30[e]	62.9[e]	1.42	
Brinkley	86	30	61.9	0.72	
Calico Rock				1.81	
Camden *a*				0.13	
Camden *b*	93	38	64.1	0.17	
Conway	90	32	64.3	1.38	
Corning	86	28	57.7	1.47	
Dallas	91	35	64.1	1.33	
Dardanelle				1.54	
Des Arc	89	31	62.6	0.88	
Dodd City	87	26	59.2	0.50	
Dutton	81	28	58.1	1.90	
Eldorado	97	36	65.6	1.04	
Elon	96[e]	32[e]	64.6[e]	0.32	
Eureka Springs	87	31[d]	62.3	0.99	
Forrest City	87	35	62.8	0.52	
Fulton				0.00	
Hardy	88	31	62.0	0.74	
Heber	91	26	61.8	0.75	
Helena *a*				0.96	
Helena *b*	87	36	62.7	0.65	
Hope	96	36	67.0	0.55	
Howe	100	34	67.8	0.25	
Lacrosse	92	32	59.8	1.00	
Lake Village	94	36	65.1	0.21	
Lonoke	91	31	64.6	0.69	
Lutherville	90	29	59.3	3.03	
Luxora				1.04	
Malvern	96	32	63.2	0.80	
Mammoth Springs	85	20	55.8	T.	
Marked Tree				0.02	
Marvell	87	31	63.0	0.82	
Mossville	84	34	58.8	2.97	
Mount Nebo	83	40	61.4	0.36	
New Gascony	90[e]	30[e]	63.1[e]	1.65	
New Lewisville	97	35	66.6	1.24	
Newport *a*				0.38	
Newport *b*	90	31	62.2	0.46	
Oregon	84	26	59.0	1.31	
Osceola	87	31	61.4	1.70	
Ozark	88	35	65.2	0.90	
Perry	86	33	62.7	1.13	
Pinebluff	92	32	62.6	0.40	
Pocahontas	88	29	60.0	0.88	
Pond	87	24	60.2	1.20	
Prescott	94	36	66.4	0.54	
Princeton	93	30	64.0	T.	
Rison	93	28	61.0	0.12	
Russellville	86	31	59.4	3.32	
Silversprings	85	29	59.9	0.57	
Spielerville	90	35	64.0	0.53	
Stuttgart	88	30	62.2	0.80	
Texarkana	96	36	67.2	1.68	
Warren	96	30	64.6	T.	
Wiggs	95	28	62.7	0.91	
Winchester	94	32	65.8	0.56	
Witts Springs	86	30	56.4	1.39	
California.					
Alturas				1.00	
Angiola	98	45	68.8	0.35	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Azusa	96	41	67.4	0.34	
Bagdad	95	47	69.4	0.00	
Bakersfield	86	46	66.4	0.78	
Barstow	95	33	62.6	0.00	
Bear Valley				10.13	
Berkeley	77	45	58.6	3.39	
Bishop	84	28	56.0	0.64	
Blue Canyon	78	31	51.8	8.75	
Boca *1	74	20	43.4	2.52	
Bodie	69	− 2	35.5	0.45	
Bowman				12.43	9.5
Branscomb	85	31	56.8	7.98	
Brush Creek	82	34	55.4	7.72	
Butte Valley				6.05	
Caliente *1	85	50	66.6	0.00	
Campbell	85	36	60.0	1.12	
Campo				0.13	
Cedarville	82	23	49.4	1.21	
Chico	87	38	60.9	2.82	
Chino *5	91	45	66.1	0.08	
Cisco *1	70	30	39.9	9.77	13.0
Claremont	96	44	68.4	0.40	
Cloverdale	92	40	62.6	4.79	
Colusa	85	41	61.6	1.28	
Corning *1	90	45	61.6	4.72	
Coronado				0.42	
Craftonville				0.74	
Crescent City	71	40	54.8	6.99	
Cuyamaca	71	25	48.8	1.18	
Delano *1	88	42	66.1	0.55	
Delta	92	32	62.3	13.94	
Dobbins	98	44	65.0	4.41	
Drytown	86	36	60.2	2.90	
Dunnigan *1	87	45	62.9	1.85	
Elcajon	97	55	73.1	0.27	
Elmdale	94	31	63.6	0.42	
Elsinore	94	38	65.0	T.	
Folsom				3.23	
Fordyce				9.20	22.0
Fort Bragg				3.97	
Fort Ross	73	44	57.4	8.28	
Foster				0.33	
Georgetown	86	36	58.3	7.42	
Greenville	86	25	50.7	4.05	
Hanford	89	38	62.8	0.84	
Healdsburg	94[d]	39[d]	63.0[d]	6.92	
Hollister	93	36	61.2	1.68	
Idylwild	81	39	61.7	0.25	
Indio	92	67	78.6	0.00	
Iowa Hill *1	82	43	57.6	6.91	
Irvine				0.79	
Isabella	86	28	59.0	0.22	
Jamestown	89	29	57.8	3.94	
Kennedy Gold Mine				3.90	
Kentfield				6.57	
Laguna Valley				0.57	
Lamesa				0.32	
Laporte	72	31	48.9	10.70	3.0
Legrande	90	50	68.9	2.79	
Lemoncove	95	43	67.8	3.47	
Lick Observatory	76	35	55.6	2.51	
Livermore	94	36	62.8	1.00	
Lodi	84	36	60.2	2.11	
Los Gatos	84	44	58.8	2.83	
Magalia	89	41	61.2	11.34	
Mammoth *1	100	48	77.6	0.00	
Marysville	91	40	63.1	3.01	
Mercury				6.44	
Mills College				3.12	
Milo				2.26	
Milton (near)	86	40	62.2	2.15	
Modesto *1	98	41	71.2	0.30	
Mohave	88	43	66.6	0.00	
Mokelumne Hill				4.27	
Montague	88	27	53.6	1.70	
Monterio	84	40	60.0	0.44	
Monterey *1	80	42	61.5	1.92	
Mount St. Helena				7.68	
Napa	92	40	62.8	2.63	
Needles	98	50	73.4	0.00	
Nellie				1.18	
Nevada City	91	27	56.9	6.89	
Newcastle	89	45	64.4	3.78	
Newman	91	39	63.3	0.92	
Niles	86	42	61.6	2.25	
Nordhoff				1.07	
North Bloomfield	86	33	55.6	6.98	
Oakland	78	47	61.2	3.29	
Ontario (near)	93	43	65.5	0.49	
Orland	92	40	63.7	2.60	
Orleans	97	40	63.0	3.99	
Oroville (near)	89	40	62.6	3.74	
Palermo	92	38	62.0	4.19	
Peachland *5	87	38	60.2	6.48	
Pilot Creek				7.98	
Pine Crest	90	49	66.0	1.16	
Placerville	82	30	55.7	4.95	
Point Lobos	75	56	64.2	2.40	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Porterville	92	40	64.2	0.60	
Poway	.....	.....	.....	0.19	
Quincy	75	26	49.8	4.79	
Redding	86	42	62.1	4.41	
Reedley	90	39	60.8	3.86	
Represa	80	42	60.6	3.41	
Riovista	86	41	61.8	2.88	
Riverside	93	37	64.2	0.21	
Rohnerville	.....	.....	.....	4.03	
Rosewood	86	35	59.2	4.19	
Sacramento	80	40	59.7	2.26	
Salinas	87	37	62.0	1.75	
Salton	102	47	74.8	0.00	
San Bernardino	97	36	64.7	0.32	
San Jacinto	79	35	54.9	0.13	
San Jose	87	40	62.6	1.43	
San Leandro	80	41	59.9	2.88	
San Mateo*[1]	87	50	62.5	2.25	
San Miguel*[1]	87	42	63.0	0.40	
San Rafael	88[1]	42[1]	62.2[1]	5.08	
Santa Barbara	88	47	55.0	0.51	
Santa Clara College	89	36	61.4	1.41	
Santa Cruz	89	38	60.5	3.63	
Santa Maria	87	46	63.8	1.25	
Santa Rosa	89	37	60.2	4.60	
Sausalito	.....	.....	.....	3.67	
Shasta	92	40	64.6	6.08	
Sierra Madre	91	49	66.6	0.57	
Sisson	83	24	50.2	6.65	
Snedden	.....	.....	.....	0.25	
Sonoma	.....	.....	.....	4.05	
Stockton	85	41	60.4	1.51	
Storey	92	37	61.3	.....	
Summerdale	78	30	52.4	6.51	
Summit	62	30	46.8	1.90	14.0
Susanville	77	24	47.4	1.69	
Tehama*[1]	87	47	63.0	3.52	
Tejon Ranch	85	44	64.4	0.60	
Truckee	70	30	48.0	3.64	2.0
Tulare[c]	90	40	63.2	1.71	
Tustin	.....	.....	.....	0.19	
Ukiah	92	33	59.0	5.35	
Upland	86	39	63.1	0.95	
Upperlake	92	29	57.6	3.79	
Upper Mattole	.....	.....	.....	11.62	
Vacaville*[1]	94	45	62.2	2.70	
Ventura	96	50	66.1	0.88	
Visalia	90	38	61.8	1.19	
Volcano	101	45	73.6	0.00	
Wasco	90	38	63.0	0.57	
Weldon	.....	.....	.....	0.00	
Westpoint	.....	.....	.....	6.80	
Wheatland	85	40	60.6	2.54	
Willits	.....	.....	.....	6.21	
Willow	90	50	65.8	1.95	
Yosemite	.....	.....	.....	3.36	
Yreka	.....	.....	.....	1.97	
Zenia	82	33	55.8	6.29	
Colorado.					
Akron	.....	.....	.....	0.70	1.5
Alford	75	15	45.3	0.32	3.0
Antelope Springs	61	9	34.6	2.46	4.0
Ashcroft	66	5	38.5	0.94	
Blaine	84	19	56.4	0.60	
Boulder	82	29	54.8	1.06	5.0
Boxelder	.....	.....	.....	0.46	1.5
Breckenridge	63	— 5	37.0	0.90	10.0
Burlington	82	18	53.0	1.35	
Canyon	81	23	52.0	0.18	T.
Cheesman	77	18	48.6	0.53	3.6
Cheyenne Wells	81	18	53.8	0.99	T.
Clearview	63	14	39.4	1.00	5.0
Collbran	78	17	47.6	0.83	8.3
Colorado Springs	74	22	49.2	0.27	.....
Conejos	74	16	45.3	0.99	
Cripplecreek	.....	.....	.....	0.66	2.1
Delta	82	11	47.7	0.20	
Durango	78	20	47.0	3.39	
Eagle	75	13	43.2	0.86	6.0
Fort Collins	80	18	48.9	0.39	
Fort Morgan	78	22	50.4	0.40	T.
Fowler	.....	.....	.....	0.66	T.
Fox	83	11	52.7	0.87	4.0
Fruita	82	20	50.0	0.88	
Garnett	74	9	41.3	0.51	2.0
Gilman	.....	.....	.....	0.32	
Gleneyre	79	18	48.2	0.44	0.2
Glenwood	81	15	46.8	0.95	
Grand Valley	81	19	49.4	1.01	
Greeley	83	22	51.2	0.46	T.
Grover	.....	.....	.....	T.	
Gunnison	79	9	40.8	0.89	
Halls Gulch	52[e]	7[e]	32.6[e]	1.83	14.0
Hoehne	79	16	50.0	0.87	4.0
Holly	88	20	56.5	0.32	
Hugo	75	18	48.8	0.62	4.0
Husted	76	14	45.4	0.63	3.0
Lake Moraine	58	10	34.0	0.75	0.5
Lamar	88	19	57.4	0.31	
Las Animas	85	15	53.6	0.45	
Lay	72	7	41.0	0.18	T.
Leadville (near)	61	8	37.6	0.55	3.0
Leroy	82	21	52.4	1.55	6.0
Longs Peak	67	9	39.4	1.15	3.0
Mancos	78	16	47.0	1.45	
Marshall Pass	.....	.....	.....	1.00	12.0
Meeker	74	11	42.1	0.77	T.
Montrose	76	17	46.3	1.14	
Platte Canyon	.....	.....	.....	0.83	5.0
Rockyford	89	21[e]	54.0	0.50	T.
Saguache	71	19	45.6	0.96	T.
Salida	77	15	45.7	0.40	
San Luis	72	13	44.3	1.34	T.
Santa Clara	71[j]	17[b]	46.2[f]	2.16	15.0
Sapinero	70	11	40.0	0.89	1.5
Sheridan Lake	83	18	54.7	0.98	T.
Silt	77	20	50.1	0.55	
Silverton	66	12	38.4	2.33	7.5
Sugar City	.....	.....	.....	0.35	T.
Sugar Loaf	70	18	45.4	0.98	10.0
Trinidad	75	27	51.9	0.63	
Victor	67[b]	10	41.6[d]	0.63	0.4
Vilas	.....	.....	.....	0.65	
Wagon Wheel	67	9	39.0	1.91	
Walden	.....	.....	.....	0.26	2.0
Waterdale	78	20	43.6	0.16	
Westcliffe	78	12	43.4	0.58	3.0
Whitepine	64	6	37.9	1.57	1.5
Wray	85	18	54.2	1.19	T.
Yuma	.....	.....	.....	1.07	6.0
Connecticut.					
Bridgeport	80	24	51.0	2.32	
Canton	75	14	46.0	3.38	T.
Colchester	77	21	48.2	2.71	
Falls Village	.....	.....	.....	2.98	T.
Hartford[b]	73	25	48.7	2.52	
Hawleyville	75	19	48.6	3.69	T.
Lake Konomoc	.....	.....	.....	1.74	
New London	75	27	50.3	1.96	
North Grosvenor Dale	78	16	46.6	2.01	T.
Norwalk	80	19	48.0	2.29	
Southington	77	20	48.3	2.55	T.
South Manchester	.....	.....	.....	2.09	
Storrs	74	21	49.2	2.19	
Voluntown	78	19	49.8	1.91	
Wallingford	.....	.....	.....	1.18	
Waterbury	78	18	49.4	3.05	
West Cornwall	75	21	47.6	2.71	T.
West Simsbury	.....	.....	.....	2.90	
Delaware.					
Delaware City	.....	.....	.....	2.95	
Milford	90	28	55.8	3.27	
Millsboro	88	26	54.5	2.62	
Newark	83	26	52.4	2.35	
Seaford	83	29	52.6	2.73	
District of Columbia.					
Distributing Reservoir*[5]	79	31	56.9	1.85	
Receiving Reservoir*[5]	79	30	56.0	1.98	
West Washington	88	26	55.0	2.41	
Florida.					
Apalachicola	96	52	74.2	0.00	
Archer	94	40	71.6	2.26	
Avon Park	96	53	75.2	11.25	
Bartow	95	48	74.9	5.35	
Bonifay	96	35	68.9	0.10	
Brooksville	96	48	74.8	3.44	
Carrabelle	98	50[b]	74.9[j]	.....	
Clermont	96	52	76.3	5.01	
De Funiak Springs	97	36	69.6	1.06	
Eustis	95	45	73.8	3.20	
Federal Point	94	46	72.8	7.88	
Fernandino	94	52	71.4	8.99	
Flamingo	90	64	78.4	7.41	
Fort Meade	97	47	76.0	10.45	
Fort Pierce	95	62	76.0	9.75	
Gainesville	95	48	72.2	2.77	
Grasmere	90	50	74.2	.....	
Huntington	96	41	72.4	5.09	
Hypoluxo	91[f]	63[f]	76.8[f]	7.43	
Inverness	94	45	73.2	3.28	
Jasper	96	35	67.8	0.25	
Johnstown	94[e]	33[e]	67.8[e]	4.66	
Kissimmee	93	52	74.0	6.72	
Lake City	.....	44	.....	2.45	
Macclenny	98	39	69.6	3.91	
Madison	95	43	70.0	0.35	
Malabar	97	54	76.6	7.28	
Manatee	91	50	74.0	3.43	
Marco	90	60	77.8	2.96	
Marianna	99	30	69.6	T.	
Merritt Island	93	58	76.4	6.33	
Miami	93	63	79.2	10.08	
Middleburg	95	36	69.5	9.48	
Molino	100	30	68.6	0.65	
Monticello	96	41	70.8	0.34	
Myers	88	58	75.6	1.78	
New Smyrna	98	47	74.9	8.34	
Nocatee	92[e]	53[e]	75.0[e]	7.62	
Ocala	96	47	72.8	3.64	
Orange City	100	44	75.0	3.88	
Orange Home	97	45	74.0	4.02	
Orlando	98	50	75.4	8.44	
Pinemount	98[f]	43[f]	71.2[f]	0.97	
Plant City	98	46	74.6	4.13	
Rockwell	.....	.....	.....	3.62	
St. Andrews	95	37	70.6	0.27	
St. Augustine	96	49	73.6	12.68	
St. Leo	95	49	74.4	2.51	
Stephensville	98	35	71.2	1.50	
Sumner	95	35	71.7	2.43	
Switzerland	94[e]	47[b]	71.4[e]	8.93	
Tallahassee	92	45	72.0	T.	
Tarpon Springs	92	45	74.0	1.06	
Titusville	99	42	74.5	5.97	
Wausau	97	35	67.8	T.	
Wewahitchka	98	34	71.4	0.04	
Georgia.					
Abbeville	.....	.....	.....	0.13	
Adairsville	86[e]	30[f]	62.8[e]	0.48	
Albany	97	44	72.4	T.	
Allapaha	92	36	67.5	0.13	
Americus	89	37	64.4	0.07	
Athens	85	36	61.5	0.99	
Blakely	.....	35	.....	0.25	
Bowersville	90	29	62.0	0.22	
Butler	.....	.....	.....	0.04	
Camak	97	37	66.3	0.20	
Carrollton	89	30	62.8	0.00	
Canton	.....	.....	.....	T.	
Carlton	.....	.....	.....	0.57	
Clayton	86	24	56.0	0.08	
Columbus	97	35	68.7	0.06	
Covington	92	35	64.6	0.38	
Cordele	94	33	66.1	0.12	
Dahlonega	86	29	59.0	T.	
Dawson	96	32	68.6	0.10	
Diamond	82	28	56.4	T.	
Dublin	.....	.....	.....	0.46	
Dudley	96	32	67.6	0.06	
Eastman	94	38	67.8	0.26	
Eatonton	90	36	63.6	0.49	
Elberton	92	33	62.4	0.62	
Experiment	87	36	64.4	0.22	
Fitzgerald	97	33	68.0	0.10	
Fleming	95	33	66.6	0.21	
Forsyth	93	31	66.9	0.39	
Fort Gaines	91	35	66.0	0.00	
Gainesville	88	34	60.1	0.12	
Gillsville	87	35	63.0	T.	
Greenbush	84	28	60.0	0.38	
Greensboro	91	32	62.9	0.41	
Griffin	93	38	65.0	0.39	
Harrison	90	32	64.8	0.24	
Hawkinsville	95	30	66.4	0.15	
Lost Mountain	88	34	62.2	T.	
Louisville	87	37	63.8	0.46	
Lumpkin	101	40	68.7	0.00	
Marshallville	90	38	65.6	0.10	
Mauzy	97[b]	.....	70.2[j]	0.03	
Milledgeville	89	34	64.4	0.69	
Millen	91	37	65.8	0.48	
Monticello	91	36	64.8	0.39	
Morgan	94	.....	68.0	T.	
Newnan	91	36	64.0	0.00	
Oakdale	.....	.....	.....	0.14	
Point Peter	89	28	61.6	0.70	
Poulan	94	36	68.2	T.	
Putnam	94	36	66.1	0.07	
Quitman	93	34	67.8	0.40	
Ramsey	87	28	60.8	0.26	
Resaca	.....	.....	.....	0.32	
Rome	88	29	60.1	0.86	
St. Marys	95	44	69.5	5.80	
Statesboro	92	40	66.0	0.12	
Talbotton	95	34	65.5	0.12	
Tallapoosa	88	27	61.6	0.16	
Thomasville	94	35	70.3	0.14	
Toccoa	86	32	59.4	0.00	
Vidalia	92	39	67.7	0.41	
Valona	94	42	68.1	0.80	
Washington	87	36	62.1	0.20	
Waverly	97	36	69.0	0.57	
Waycross	94	39	68.8	0.28	
Waynesboro	90	37	63.2	1.05	
Westpoint	99	29	64.4	0.02	
Woodbury	89	28	61.4	0.48	
Idaho.					
Albion	75	19	47.5	1.28	
American Falls	83	20	48.8	1.37	
Blue Lakes	89	25	56.4	0.56	
Cambridge	85	25	52.3	1.74	
Chesterfield	76	14	43.6	0.56	5.0
Dewey	76	18	45.4	2.40	0.5
Ditto Creek	84	28	54.0	1.49	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Forney	84	18	45.0	1.01	T.
Garnet	90	30	57.3	0.67	
Grangeville	81	30	51.0	1.86	
Idaho City	84[c]	23	51.5	1.38	
Lake	72	20	45.4	.....	
Lakeview	79	29	47.2	1.25	
Landore	.....	.....	.....	2.99	0.8
Lost River	75	20	46.8	0.63	T.
Lovell	83[c]	25[c]	52.2[c]	1.83	
Meadows	76	22	46.0	2.27	3.0
Milner	88	11	47.4	0.47	
Moscow	78	30	51.1	1.49	
Murray	78	22	44.0	1.88	1.0
Oakley	79	24	50.6	0.87	
Ola	81	25	52.0	2.04	
Payette	85	28	54.4	0.80	
Pollock	83	33	54.6	1.48	
Poplar	.....	.....	.....	1.89	
Porthill	74	24	45.3	0.92	
Roosevelt [1]	66	17	42.3	.....	1.0
St. Maries	85	28	50.2	1.58	
Soldier	82	7	45.6	0.95	
Swan Valley	76	11	44.5	.....	2.0
Vernon	71	19	47.5	0.75	
Victor	82	10	45.8	1.71	5.0
Illinois.					
Albion	83	29	55.4	0.45	
Aledo	80	25	53.5	0.62	
Alexander	85	26	56.2	0.27	
Antioch	80	23	53.2	1.20	
Ashton	81	22	51.4	0.93	
Astoria	82	26	53.8	0.38	T.
Aurora	80	25	51.4	1.53	
Benton	85	29	58.8	0.26	
Bloomington	84	27	57.0	0.52	T.
Bushnell	85	27	56.8	0.44	
Cambridge	82	30	55.9	0.27	
Carlinville	84	28	56.5	0.43	
Carrollton	85	28	57.0	0.50	
Charleston	83	26	55.4	0.80	
Chester	.....	.....	.....	1.42	
Cisne	85	25	57.8	0.34	
Contsburg	82	26	55.1	0.16	
Cobden	84	32	58.6	0.90	
Danville	85[b]	24[c]	55.9[b]	0.90	
Decatur	85	28	56.2	0.18	
Dixon	83	21	51.6	0.86	
Effingham	83	28	55.8	0.27	
Equality	85	28	58.9	2.05	
Fandon	84	27	55.7	0.18	
Flora	81	22	54.2	0.37	
Friendgrove	80	29	55.4	0.27	
Galva	82	26	52.8	0.24	
Grafton	.....	.....	.....	1.35	
Greenville	85	32	58.0	1.31	
Griggsville	85	30	56.8	0.50	
Halfway	81	33	58.0	0.83	
Havana	85	27	55.8	0.31	
Henry	83[c]	24[b]	55.4[c]	0.31	
Hillsboro	85	30	57.7	0.62	
Hoopeston	80	24	53.1	0.38	
Joliet	80	29	52.9	1.44	
Kishwaukee	82	24	52.5	1.89	T.
Knoxville	82	24	53.0	0.10	
Lagrange	81	28	52.0	1.59	
Laharpe	85	28	55.9	0.45	
Lanark	82	22	52.2	1.20	
Loami	.....	.....	.....	0.05	
McLeansboro	84	31	57.0	0.40	
Martinsville	82[l]	23[b]	54.7[l]	0.60	
Martinton	83	25	53.8	1.23	
Mascoutah	88	28	55.6	0.88	
Matteon	87	33	60.0	0.17	
Minonk	85	24	54.3	0.17	
Monmouth	83	24	53.0	0.36	
Morrison	83	24	53.2	0.60	T.
Morrisonville	82	29	56.3	0.74	
Mount Carmel	.....	.....	.....	0.60	
Mount Pulaski	82	28	56.0	0.50	
Mount Vernon	85	27	58.0	0.56	
New Burnside	84	29	58.0	1.74	
Olney	83	27	56.6	0.53	
Ottawa	83	27	55.0	0.26	
Palestine	84	24	55.8	0.10	
Pana	83	30	55.9	0.54	
Paris	84	31	55.1	1.01	
Peoria *a*	.....	.....	.....	0.06	
Peoria *b*	84	30	54.8	0.10	
Philo	83	21	53.3	0.53	
Plumhill	82	27	56.2	0.72	
Pontiac	82	29	54.6	0.17	
Rantoul	83	23	54.4	0.76	
Raum	84	32	59.6	1.47	
Riley	79	26	52.0	1.28	
Robinson	82	25	55.0	0.46	
Rushville	85	28	56.2	0.22	
St. Charles	81	24	51.7	1.86	
St. John	84	27	58.0	0.83	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Shobonier	86	24	56.8	0.81	
Streator	83	26	54.0	0.20	
Sullivan	83	27	54.6	0.58	
Sycamore	81	24	51.4	0.84	
Tilden	82	28	57.1	0.57	
Tiskilwa	80	27	52.4	0.28	
Tuscola	82	23	53.1	1.42	
Urbana	81	28	53.0	0.81	
Walnut	84	27	54.6	0.37	
Warsaw	.....	.....	.....	0.00	
Winchester	84[c]	31[d]	56.0[c]	0.09	
Windsor	82	25	53.1	0.46	
Winnebago	80	24	52.0	1.95	T.
Yorkville	81	24	51.6	1.44	
Zion	80	24	51.5	2.36	
Indiana.					
Anderson	80	24	53.0	0.78	
Angola	77	26	50.3	2.54	T.
Auburn	77	22	50.7	1.40	
Bloomington	79	29	54.8	1.30	
Bluffton	81	22	51.8	1.85	
Butlerville	84	25	55.3	0.60	
Cambridge City	81	23	51.6	1.52	
Columbus	82	24	54.1	1.38	
Connersville	85	25	54.1	0.88	
Crawfordsville	80	25	53.0	1.35	
Delphi	82	22	51.6	0.65	
Farmersburg	84	23	56.0	0.68	
Farmland	79	26	52.4	0.88	
Fort Wayne	80	24	52.0	2.00	T.
Franklin	83	21	53.8	1.73	
Greencastle	78	27	53.6	1.01	
Greenfield	81	25	54.0	0.98	
Greensburg	83	27	54.1	0.91	
Hammond	81	30	53.0	1.48	
Hector	80	23	51.6	T.	
Holland	88	25	57.6	0.30	
Huntington	78	24	50.6	1.47	
Jeffersonville	84	29	56.9	0.27	
Kokomo	80	24	52.0	1.28	T.
Lafayette	82	26	52.0	0.78	
Laporte	78	26	50.6	1.22	T.
Logansport	80	25	52.2	1.08	
Madison *a*	90	26	57.2	0.39	
Madison *b*	.....	.....	.....	0.46	
Marengo	86	25	54.7	1.26	
Marion	80	23	52.4	1.27	
Markle	80	22	52.0	1.30	
Mauzy	86	23	53.6	1.06	
Moores Hill	86	27	55.6	0.50	
Mount Vernon	82	26	55.2	0.10	
Northfield	80	20	50.6	1.01	
Paoli	87	24	55.3	0.64	
Princeton	84	25	55.9	0.58	
Rensselaer	80	28	52.3	1.14	
Richmond	83	23	52.4	1.98	
Rochester	80	25	52.6	1.42	
Rockville	81	29	54.2	0.96	
Rome	87	22	59.1	0.06	
Salem	86	22	56.6	0.56	
Scottsburg	85[b]	27[l]	56.6[l]	0.27	
South Bend	80	27	51.2	2.12	
Syracuse	79	25	51.8	2.51	
Terre Haute	82	28	57.2	0.81	
Topeka	81	26	53.0	1.00	
Valparaiso	80	28	53.8	1.12	
Veedersburg	79[l]	23[l]	55.2[l]	0.87	
Vevay	87	29	56.4	0.95	
Vincennes	86	26	56.5	0.86	
Washington	83	27	53.7	0.58	
Worthington	84	24	55.4	2.48	
Indian Territory.					
Ardmore	93	35	65.1	2.23	
Calvin	.....	.....	.....	2.59	
Claremore	99	30	62.4	0.40	
Durant	96	36	65.4	3.42	
Fairland	91	24	62.0	1.47	
Fort Gibson	.....	.....	.....	1.01	
Goodwater	100	31	65.5	0.85	
Hartshorne	95	36	65.4	2.03	
Healdton	94	30	63.8	0.86	
Holdenville	91	35	64.2	2.22	
Marlow	95	35	64.4	T.	
Muskogee	91	31	62.8	1.32	
Okmulgee	90	29	62.9	2.01	
Pauls Valley	.....	.....	.....	0.85	
Ravia	95	36	67.2	2.19	
Roff	91	38	66.4	1.68	
South McAlester	92	34[f]	67.6[e]	1.91	
Tulsa	.....	.....	.....	0.49	
Vinita	89[j]	20[j]	64.0[j]	0.48	
Wagoner	91	28	62.8	1.10	
Webbers Falls	91	26	60.6	1.14	
Iowa.					
Afton	.....	.....	.....	0.85	
Albia	82	24	53.7	0.21	
Algona	76	22	50.4	1.47	
Allerton	84	23	55.4	0.52	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alta	78	25	50.6	2.46	
Amana	79	22	52.6	1.00	
Ames	84	23	53.6	1.78	
Atlantic	85	19	52.4	1.40	
Audubon	87	19	53.0	1.82	
Baxter	83	23	53.0	1.40	
Bedford	85	23	55.9	0.58	
Belknap	82[b]	32[f]	58.4[e]	.....	
Belleplaine	81	22	52.3	1.55	
Bonaparte	83	26	54.6	0.14	
Britt	87	22	50.9	1.65	
Buckingham	.....	.....	.....	1.83	T.
Burlington	83	2	55.8	0.43	
Carroll	85	24	52.7	1.99	
Cedar Rapids	82	25	52.8	1.04	
Chariton	84	24	54.8	0.45	
Charles City	78	21	49.4	1.94	
Clarinda	90	25	54.4	1.72	
Clearlake	76	26	51.0	2.65	
Clinton	83	26	51.8	0.59	
College Springs	85	27	56.6	1.34	
Columbus Junction	81	25	53.1	0.74	T.
Corning	83	22	54.6	2.13	
Corydon	88	22	56.4	0.14	
Cresco	76[c]	25[c]	52.2[c]	2.25	
Cumberland	.....	.....	.....	1.32	
Decorah	88	23	51.6	3.92	
Delaware	78	22	50.4	2.62	
Denison	85	20	53.3	1.41	
Desoto	88	22	54.9	1.57	
Dows	79	20	51.3	2.13	T.
Earlham	85[f]	16[f]	52.8[f]	1.55	
Elkader	82	20	51.8	1.74	
Estherville	77	22	49.2	2.85	
Florence	.....	.....	.....	1.69	
Forest City	88	24	51.0	1.89	
Fort Dodge	77	22	51.5	2.08	
Fort Madison	.....	.....	.....	0.52	
Galva	.....	19	.....	2.93	
Glenwood	85	26	56.2	0.45	
Grand Meadow	76	25	50.8	3.09	
Greene	78	23	51.6	2.34	
Greenfield	83	24	54.1	1.49	
Grinnell	81	25	53.6	0.64	
Grinnell (near)	82	24	53.8	0.83	
Grundy Center	81	23	52.8	1.70	
Guthrie Center	84	22	54.0	2.68	
Hampton	86	23	53.2	2.13	
Hanlontown	79	29	50.0	2.23	
Harlan	84	20	53.0	0.92	
Hopeville	85	26	55.1	0.90	
Humboldt	77	22	52.3	1.59	
Ida Grove	80	29	52.2	1.40	
Independence	80	23	51.5	1.89	
Indianola	86	24	54.0	1.09	
Inwood	80	26	50.6	4.34	
Iowa City	81	24	53.2	1.59	
Iowa Falls	79	19	50.4	1.92	
Keosauqua	82	25	53.5	0.39	
Lacona	.....	.....	.....	1.20	
Larrabee	81	24	51.8	3.18	
Leclaire	.....	.....	.....	0.87	
Lemars	82	20	51.1	.....	
Lenox	85	25	54.6	1.03	
Leon	80	25	54.4	0.74	
Little Sioux	89	23	55.6	1.34	
Logan	85	22	53.5	1.53	
Maple Valley	.....	.....	.....	2.45	
Maquoketa	81	20	51.0	1.83	
Marshalltown	85	22	52.1	1.73	
Mason City	75	27	51.0	1.85	
Mountayr	86	26	56.8	1.08	
Mount Pleasant	82	26	54.0	0.43	
Mount Vernon	80	24	52.8	2.49	
Muscatine	.....	.....	.....	1.00	
New Hampton	77	24	50.6	2.34	
Northwood	.....	.....	.....	2.30	
Odebolt	80	21	52.5	1.24	
Ogden	83	25	53.4	1.53	
Olin	79	26	52.4	3.78	
Onawa	85	29	55.7	2.07	
Osage	76	24	49.8	2.08	
Osceola	86	27	57.4	0.27	
Oskaloosa [c]	82	25	54.9	.....	
Pacific Junction	87	22	55.2	1.07	
Perry	84	23	53.4	2.01	
Plover	78	24	50.8	2.62	
Pocahontas	78	25	52.0	2.40	
Redoak	81	30	56.2	2.00	
Ridgeway	80	25	51.8	2.71	
Rock Rapids	78	25	51.0	2.65	
Rockwell City	80	25	52.0	1.88	
Sac City	78	24	52.3	1.18	
St. Charles	89	24	56.2	1.50	
Sheldon	85	22	52.4	3.86	
Sibley	81	22	51.1	3.96	
Sioux Center	82	26	54.3	4.43	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Spirit Lake	78	22	50.4	2.38	
Stockport	81	27	55.2	0.34	T.
Storm Lake	79	26	50.4	3.09	
Stuart	82	26	54.1	2.17	
Thurman	86	22	55.4	2.44	
Tipton	80	27	54.1	0.89	
Toledo	82	19	53.2	1.10	T.
Vinton	81	19	53.5	1.35	
Wapello	78	29	53.9	0.77	T.
Washington	82	26	53.9	0.54	
Washta				2.50	
Waterloo	81	23	53.8	1.24	
Waukee	96	24	56.0	1.07	
Waverly	79	23	52.4	1.68	
Westbend	77	22	50.6	1.58	
Whatcheer	86[b]	24[c]	55.2[c]	0.27	
Whitten	79	21	51.7	1.50	
Wilton Junction	84	24	53.4	0.94	
Winterset	90	20	55.2	1.00	
Woodburn				0.50	
Zearing	83	21	52.6	1.01	
Kansas.					
Achilles	91	13	55.1	1.78	0.5
Alton	89	21	58.8	0.70	
Anthony				0.40	
Atchison	84	27	57.2	3.58	
Baker	89	26	56.8	2.50	
Burlington	90	25	60.2	0.97	
Chapman	85	29	61.2	0.71	
Clay Center	86	25	56.8	2.77	
Coffeyville	95	28	64.4	2.00	
Colby	95	16	56.0	1.78	T.
Columbus	86	26	59.5	0.30	
Cunningham	93	23	62.4	1.20	
Dresden	90	24	57.8	2.83	T.
Eldorado	89	26	61.0	0.44	
Ellinwood	85	26	59.2	0.63	
Ellsworth	89	25	59.2	0.32	
Emporia	91	28	59.2	0.47	
Englewood	91	28	61.4	0.77	
Enterprise	86	29	57.3	0.74	
Eureka				0.86	
Fall River	86	23	59.4	0.72	
Farnsworth	89	23	57.9	2.36	
Forsha	90	26	60.6	0.67	
Fort Leavenworth	83	32	59.4	1.59	
Fort Scott	89	26	59.5	0.92	
Frankfort	89	23	57.8	2.31	
Fredonia	88[c]	29[c]	59.4[c]	0.46	
Garden City	88	23	58.1	1.20	T.
Gove[*1]	87	25	55.3	2.00	
Grenola	86	22	58.8	0.66	
Harrison	89	23	56.4	1.68	
Holton		27		1.09	
Horton	86	27	58.0	2.42	
Hoxie	87	22	57.0	2.78	
Hugoton	88	24	58.4	1.14	
Hutchinson	87	24	57.9	0.66	
Independence	89	29	61.4	1.19	
Iola				0.44	
Lakin	85	22	56.3	0.83	
Larned	88	19	57.0	1.70	
Lebanon	90	21	56.5	1.50	
Lebo	89	30	59.8	1.27	
Macksville	89	21	59.6	0.10	
McPherson	88	26	60.6	1.53	
Madison	90	23	57.9	0.70	
Manhattan *b*	91	26	59.8	0.99	
Manhattan *c*	93	27	58.0	1.06	
Marion	82	29	59.0	0.85	
Medicine Lodge	96	25	62.0	0.91	
Minneapolis	87	26	57.8	2.55	
Moran	87	28	60.9	0.67	
Mounthope	84	32	60.2	1.03	
Ness City	90	26	60.1	1.07	
Norton	91	22	58.0	3.65	
Norwich	92	28	61.3	0.51	
Oberlin				2.41	
Olathe	84[j]	39[j]	62.9[j]	0.55	
Osage City	90[f]	26[f]	58.9[f]	0.13	
Osborne				0.87	
Oswego	88	25	61.2	0.18	
Ottawa	88	23	58.2	0.68	
Plainville	87	32	61.0	1.71	
Pleasanton	85	25	60.2	0.35	
Pratt	91	26	61.2	0.75	
Republic	88	23	57.0	2.21	
Rome	95	22	62.2	0.78	
Russell	89	24	59.3	0.86	
Salina	86	25	59.8	2.14	
Sedan	85	27	59.4	0.78	
Toronto	89	21	58.5	0.75	
Ulysses	94[c]	21[c]	56.6[c]	1.25	
Valley Falls	85	26	60.0	0.53	
Viroqua	86	22	56.9	0.96	
Wakeeney (near)				1.63	
Wallace	87	24	56.7	0.91	
Walnut	86	28	61.2	0.85	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wamego[*1]	84	28	57.6	0.52	
Winfield	85	26	59.9	0.45	
Kentucky.					
Alpha	84	28	59.2	0.60	
Anchorage [d]	86	24	55.6	0.28	
Bardstown	89	25	59.6	0.20	
Beattyville	90	25	56.2	0.43	
Beaver Dam	87	28	56.4	0.37	
Berea	88	25	57.7	0.93	
Blandville	82	32	57.5	1.03	
Bowling Green	90	26	58.6	0.05	
Burnside	88	27	57.4	0.63	
Cadiz	83	28	59.2	0.54	
Calhoun	86	27	58.8	0.20	
Catlettsburg	89	29	57.8	0.72	
Earlington	87	27	57.2	0.33	
Edmonton	87	23	54.8	0.30	
Eubank	86	25	55.0	0.74	
Falmouth				0.67	
Fords Ferry	85	23	57.0	0.82	
Frankfort	84	29	56.6	0.38	
Greensburg	90	22	56.3	0.16	
Highbridge	88			0.32	
Hopkinsville	87	25	58.2	0.35	
Irvington	93	28	58.6	0.26	
Jackson	89	20	58.4	0.98	
Leitchfield	85	27	56.6	0.20	
Loretto	86	20	59.2	0.24	
Manchester	88	23	56.2	1.60	
Mayfield	85	29	57.6	0.84	
Maysville	88	27	57.4	0.47	
Mount Sterling	84	26	54.8	0.45	
Owensboro	85	31	57.7	0.10	
Owenton	83	34	56.6	0.42	
Paducah *a*				1.24	
Paducah *b*	87	34	60.0	1.35	
Princeton	86	27	58.2	0.67	
Richmond	87	29	60.2	0.40	
St. John	84	26	56.0	0.21	
Scott	86	26	56.6	0.80	
Shelby City	89	22	57.4	0.28	
Shelbyville	88	24	56.8	0.44	
Taylorsville	86	23	55.8	0.44	
Williamsburg	90	27	58.1	0.85	
Williamstown	85	33	59.0	0.53	
Louisiana.					
Abbeville	95	41	71.6	1.18	
Alexandria	96	37	68.9	0.50	
Amite	96	35	68.2	0.50	
Baton Rouge	98	43	72.0	0.91	
Burnside	95	38	69.9	0.65	
Calhoun				0.50	
Cameron	94	45	72.0	0.74	
Clinton	93	36	67.9	0.02	
Collinston	93	33	65.4	0.75	
Covington	97	36	69.4	0.26	
Donaldsonville				0.38	
Emilie	94	42	70.0	0.45	
Farmerville	96[c]	38[c]	67.3[c]	0.00	
Franklin	98	42	72.6	0.27	
Georgetown	98	33	66.8	0.90	
Grand Coteau	95	40	70.0	0.42	
Hammond	93	36	67.8	0.31	
Houma	91	37	69.0	0.88	
Jennings	96	38	70.4	0.75	
Lafayette	96	39	70.2	0.44	
Lake Charles	97	42	71.1	0.30	
Lakeside	94	45	70.8	1.87	
Lawrence	96	50	73.1	1.30	
Leesville	95	32	67.2	0.39	
Libertyhill	100	36	68.5	0.15	
Logansport				0.42	
Mansfield	97	34	66.0	0.57	
Melville	97	38	68.8	0.50	
Minden				0.55	
Monroe	101	39	70.0	2.10	
New Iberia	91	46	71.1	T.	
Opelousas	97	38	69.3	0.30	
Oxford	96[c]	37[f]	69.4[f]	1.35	
Plain Dealing	98	32	67.0	0.55	
Port Eads	92	61	76.2	1.66	
Rayne	96	40	71.0	0.10	
Robeline	95	33	65.8	0.55	
Ruston	100	34	67.8	0.00	
St. Francisville	92	37	69.2	T.	
Schriever	98	35	70.0	0.35	
Southern University				2.13	
Sugar Experiment Station	94	45	71.0	0.75	
Sugartown	94	40	69.6	0.00	
Venice	95	44	73.9	1.32	
Maine.					
Bar Harbor	69	24	47.0	2.55	T.
Belfast	70	17	45.4	2.91	
Chesuncook				1.70	
Cornish	72	18	44.6	1.41	0.5
Danforth				2.66	T.
Fairfield	72	20	45.2	2.05	
Farmington	73	16	44.8	2.09	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Gardiner	72	19	45.4	2.02	T.
Houlton	66	18	45.2	3.40	0.8
Lewiston	74	25	46.4	1.88	0.5
Madison	68	22	44.7	2.98	
Mayfield	63	17	41.6	2.42	T.
Millinocket	65	23	44.3	3.21	0.5
North Bridgton	75	22	46.4	1.70	T.
Oquossoc	64	15	40.4	1.69	T.
Orono	69	20	46.1	3.10	T.
Patten	66	15	41.9	3.10	0.5
Rumford Falls	70	22	44.8	2.76	T.
South Lagrange	76	20	46.8	2.40	T.
The Forks				2.23	
Vanburen	65	16	43.0	2.86	T.
Vanceboro	68	18	43.5	2.66	T.
Winslow	72	19	42.6	2.64	
Maryland.					
Annapolis	81	32	55.4	3.30	
Bachmans Valley	83	22	50.4	2.49	
Boettcherville	91	20	54.4	1.38	
Cambridge	89	31	57.0	2.03	
Chase	85			3.78	
Cheltenham	87	27	53.5	2.20	
Chestertown	79	30	52.6	2.27	
Chewsville	88	20	52.7	2.67	
Clearspring	88	26	52.4	2.69	
Coleman	85	29	55.0	2.76	
Collegepark	90	24	54.6	2.27	
Colora				4.43	
Cumberland				0.61	
Darlington	82	24	51.4	5.30	
Deerpark	80[f]	16[f]	46.9[f]	1.98	0.5
Denton	88	28	53.9	1.92	
Easton	84	28	53.4	2.42	
Fallston	83	25	52.6	4.19	
Frederick	91	23	54.4	1.56	
Grantsville	85	14	49.8	1.65	T.
Greatfalls	90	22	53.8	2.07	
Greenspring Furnace	90	22	53.4	2.33	
Hancock	89	20	53.4	2.10	
Harney				2.17	
Jewell	86	28	54.9	3.11	
Johns Hopkins Hospital	86	30	55.4	3.93	
Laurel	89	28	53.6	3.00	
McDonogh				3.10	
Mount St. Marys College	86	26	54.4	1.90	
New Market	86	23	53.1	2.24	
Oakland	79	15	49.0	1.53	
Pocomoke City	83	32	55.4	2.70	
Princess Anne	85	27	54.0	2.84	
Solomons	86	35	57.6	1.13	
Sudlersville	85	26	54.9	2.88	
Takoma Park	86	27	52.8	2.44	
Van Bibber	80	28	52.4	4.24	
Westernport	82[d]	25[d]	50.4[d]	1.29	
Woodstock	82	26	54.0	3.23	
Massachusetts.					
Amherst	78	18	47.1	1.74	T.
Bedford	69	20	47.5	1.69	T.
Bluehill (summit)	72	22	47.9	2.72	T.
Cambridge	74	23	49.6	2.00	
Chestnuthill	75	22	49.3	2.21	
Concord	74	17	46.2	1.55	T.
East Templeton[*1]	68	22	45.4	1.00	T.
Fall River	72	24	49.6	1.57	T.
Fitchburg *a*[*1]	68	24	45.5	2.00	
Fitchburg *b*	75	23	47.8	1.71	T.
Framingham	75	20	48.4	1.51	
Groton	72	18	45.5	1.25	
Hyannis				2.23	
Jefferson				1.92	T.
Lawrence	68	21	47.1	1.09	
Leominster				1.51	T.
Lowell *a*	74	24	49.6	1.28	
Lowell *b*	74	22	48.4		
Ludlow Center	71	16	43.7	1.39	
Middleboro	77	19	47.8	1.80	
Monson	74	17	46.8	1.97	
New Bedford	73	22	48.6	1.36	
Plymouth[*1]	71	27	49.5	1.87	
Princeton				1.95	
Provincetown	72	32	53.0	1.99	
Salem				2.21	
Somerset	76	20	50.1	1.40	
Sterling				1.70	
Taunton	76	15	47.6	1.72	
Webster				2.00	T.
Westboro	77	16	48.9	1.37	
Weston	72	16	46.6	1.71	
Williamstown	69	21	46.2	2.56	
Winchendon				1.61	T.
Worcester	73	24	48.6	0.96	T.
Michigan.					
Adrian	80	21	49.8	0.65	
Agricultural College	78	22	48.6	1.90	T.
Allegan	80[f]	27[f]	50.2[f]	5.42	
Alma	78	23	47.7	2.59	T.
Ann Arbor	79	23	49.4	0.81	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Arbela	77	25	48.6	2.93	
Baldwin	80	22	48.4	1.29	
Ball Mountain	79	24	48.2	3.00	T.
Baraga	72[a]	22[b]	44.0[c]	3.10	T.
Battlecreek	76	21	48.6	2.98	T.
Bay City	80	26	48.6	2.50	T.
Benzonia	75[c]	26[c]	47.2[c]	4.28	T.
Berlin	78	20	46.6	2.15	T.
Berrien Springs	83[c]	26[c]	52.8[c]	2.27	
Big Rapids	79	20	45.2	3.66	T.
Birmingham	77	26	48.9	1.52	
Bloomingdale	80	29	51.4	3.53	T.
Calumet	68	27	43.6	5.75	0.2
Cassopolis	77[f]	26[f]	49.4[f]	3.00	0.5
Charlevoix	76[i]	29	49.1[g]	2.30	4.0
Chatham	76	20	43.4	1.29	0.2
Clinton	78	20	49.8	1.26	
Coldwater	88	26	51.8	4.57	
Deer Park	68	25	43.2	3.25	T.
Detour	67	27	44.6	2.77	1.5
Dundee	80	25	50.4	0.82	
Eagle Harbor	68	29[c]	44.1	4.80	T.
East Tawas	72	20	44.5	1.67	
Eloise	78	23	49.3	.....	
Ewen	70	17	42.6	0.82	3.0
Fitchburg	80	19	47.7	2.08	T.
Flint	77	20	48.6	4.07	
Gaylord	69	23	45.8	.....	2.5
Gladwin	79	17	46.0	4.30	T.
Grand Haven	73	30	49.8	3.28	
Grand Marais	74[c]	25	45.6[c]	4.76	T.
Grape	78	24	49.8	0.93	
Grayling	80	19	44.3	2.50	3.0
Hagar	78	27	51.0	2.67	
Harbor Beach	73	24	48.4	2.48	
Harrison	78	23	46.6	3.75	T.
Harrisville	76	24	46.4	1.57	T.
Highland	.....	.....	.....	2.64	T.
Hillsdale	77	26	49.4	1.93	
Howell	76	26	47.2	1.58	
Humboldt	66[f]	15[c]	39.8[c]	.....	4.0
Ionia [1]	78	25	48.2	.....	
Iron Mountain	72	19	44.0	3.52	T.
Iron River	71	16	42.2	5.90	0.5
Ironwood	70	24	43.8	5.39	3.0
Ishpeming	69	22	44.0	4.15	6.0
Ivan	75	22	44.2	2.43	1.5
Jackson	79	25	50.3	1.24	
Jeddo	77	26	48.2	2.33	
Kalamazoo	77	27	51.2	1.84	
Lake City	.....	.....	.....	1.55	
Lansing	78	27	49.0	2.20	T.
Ludington	70[j]	28[j]	50.0[j]	2.09	
Mackinac Island	71	28	45.2	6.65	T.
Mackinaw City	.....	.....	.....	3.30	T.
Mancelona	76	22	44.7	2.71	3.0
Marine City	79	28[f]	49.3[c]	2.00	
Menominee	76	25	47.5	2.15	T.
Midland	.....	.....	.....	1.24	
Montague	78	29	50.4	3.35	
Mount Clemens	.....	.....	.....	1.11	
Muskegon	75	29	49.6	6.15	
Newberry	65	.....	.....	.....	
Old Mission	74	30	47.9	2.88	2.0
Olivet	75	28	48.8	2.87	T.
Omer	76[c]	.....	.....	0.99	T.
Onaway	74	20	45.2	.....	
Ovid	76	27	48.7	4.79	
Owosso	79	.....	.....	.....	
Petoskey	75	27	48.9	3.80	4.0
Plymouth	80[c]	.....	.....	.....	
Powers	.....	20	.....	.....	
Reed City	78	22	46.6	3.20	T.
Roscommon	70[h]	.....	.....	1.57	0.5
Saginaw (W. S.)	80	24	48.6	2.02	T.
St. Ignace	72	28	46.2	1.15	
St. Johns	80	26	50.3	3.25	
St. Joseph	.....	.....	.....	1.25	
Slocum	74	28	48.2	6.22	T.
South Haven	77	27	49.0	2.17	
Stanton	79	20	48.0	5.60	
Thomaston	70	18	42.6	1.32	4.0
Thornville	75	23	47.9	3.40	T.
Traverse City	72[c]	28[h]	48.2[c]	2.68	T.
Vassar	78	31	50.4	.....	
Wasepi	78	25	49.0	2.19	T.
Webberville	77	22	47.7	2.98	T.
West Branch	73[j]	20[j]	45.2[j]	1.30	T.
Wetmore	70	.....	.....	3.30	6.0
Whitefish Point	67	25	43.4	3.16	T.
Ypsilanti	78	20	47.4	1.09	
Minnesota.					
Albert Lea	76	23	49.6	2.92	
Alexandria	75	21	46.2	3.24	T.
Angus	72[c]	17[c]	44.8[c]	1.49	0.3
Ashby	77[h]	22[h]	47.4[h]	.....	0.2
Beaulieu	72	21	45.4	1.89	T.
Bemidji	69	25	46.2	2.26	5.0
Bird Island	75	22	49.6	4.12	
Blooming Prairie	78	25	49.2	4.25	
Caledonia	77	22	49.9	2.61	T.
Collegeville	75	26	47.0	4.61	T.
Crookston	71	23	45.8	2.98	T.
Deephaven	.....	.....	.....	5.75	
Detroit City	71	21	44.8	1.21	T.
Faribault	77	22	49.2	3.69	
Farmington	74	26	48.5	4.69	T.
Fergus Falls	71	23	47.2	1.44	T.
Floodwood	70	23	44.4	2.80	
Glencoe	77	25	47.8	4.40	
Grand Meadow	78	24	49.4	3.15	T.
Hallock	70	18	44.3	0.39	0.2
Lake Winnibigoshish	65	24	43.4	1.47	0.9
Leech	73	20	44.8	2.43	
Long Prairie	77	19	45.8	4.40	T.
Luverne	80	25	49.2	5.03	
Lynd	78	20	48.6	2.68	
Mankato	.....	.....	.....	2.14	
Mapleplain	77	25	48.8	6.88	T.
Milan	80	20	48.6	4.45	
Minneapolis [1]	76[g]	25	47.9	5.19	T.
Montevideo	80	23	49.8	3.13	
Mora	70	19	45.8	5.25	0.3
Morris	76	28	47.4	2.64	
Mount Iron	68	18	43.6	2.66	0.5
New London	78	22	44.6	3.15	
New Richland	78	25	51.4	2.01	
New Ulm	78	26	50.0	5.03	
Park Rapids	66	22	43.8	1.72	T.
Pine River	70	20	44.8	4.67	T.
Pleasant Mounds	76	24	50.8	2.88	
Pokegama Falls	68	11	40.5	2.75	2.0
Redwing [a]	.....	.....	.....	6.30	
Reeds	.....	.....	.....	5.10	
Rolling Green	78	26	50.0	2.05	
St. Charles	77	23	49.7	3.09	
St. Cloud	70[m]	26	47.1[g]	5.01	T.
St. Peter	80	21	51.1	3.88	
Sandy Lake Dam	70	20	44.1	3.68	1.2
Shakopee	77	23	47.2	5.36	
Wabasha	79	23	51.8	4.32	T.
Wadeña	72	22	45.4	1.92	T.
Willow River	67	19	44.0	5.44	1.7
Winnebago	78	25	51.2	2.72	
Winona	78	25	50.7	2.91	T.
Worthington	82	21	48.3	6.37	
Zumbrota	75	20	49.2	5.15	T.
Mississippi.					
Aberdeen	90	30	62.4	0.23	
Austin	89	30	61.2	1.08	
Batesville	90	29	61.4	0.75	
Bay St. Louis	97	45	72.0	2.45	
Biloxi	98	46	72.8	1.12	
Booneville	86[f]	34[f]	59.7[f]	0.18	
Brookhaven	97	34	66.6	0.00	
Canton	95	30	65.9	0.00	
Columbia	98	30	66.4	0.00	
Columbus	95	30	63.5	0.10	
Corinth	85	31	59.5	0.61	
Crystal Springs	96	39	68.4	0.00	
Duck Hill	93[d]	24[d]	59.4[d]	T.	
Edwards	93	33	66.0	0.06	
Fayette	93	35	65.2	T.	
Fayette (near)	.....	.....	.....	T.	
Greenville [a]	90	36	64.5	0.15	
Greenville [b]	94	38	66.6	0.16	
Greenwood	93	31	63.8	T.	
Hazlehurst	98	36	68.6	0.00	
Hernando	90	37	64.2	0.65	
Holly Springs	86	38	62.8	0.21	
Jackson	93	35	64.8	0.00	
Kosciusko	98	32	66.6	0.00	
Lake	93	30	63.8	0.15	
Lake Como	98	32	67.5	0.08	
Laurel	98	32	67.4	0.24	
Leakesville	100	31	69.1	0.12	
Louisville	93	32	66.0	T.	
Macon	94	35	65.1	0.35	
Magee	95	29	65.2	0.00	
Magnolia	99	32	70.3	0.13	
Natchez	98	40	71.1	T.	
Nitta Yuma	92	36	66.8	0.12	
Okolona	97	31	63.4	T.	
Patmos	.....	.....	.....	0.09	
Pearlington	97[c]	40[c]	69.4[c]	1.97	
Pecan	97	36	72.0	1.20	
Pittsboro	92	32	63.6	0.23	
Pontotoc	87	32	63.4	T.	
Poplarville	93	37	69.0	1.80	
Port Gibson	96	31	65.7	T.	
Shoccoe	97	32	66.0	T.	
Stonington	.....	.....	.....	0.00	
Suffolk	96	36	67.6	T.	
Tchula	99	30	65.2	T.	
Tupelo	83	28	58.7	0.21	
University	91	36	65.0	0.23	
Walnutgrove	94	32	66.0[d]	0.00	
Watervalley	92	31	64.4	0.15	
Waynesboro	98	29	66.8	0.20	
Woodville	94	44	68.8	0.00	
Yazoo City	97	33	65.6	0.00	
Missouri.					
Appleton City	89	25	60.2	0.48	
Arthur	87	23	58.4	0.51	
Avalon	86	27	56.9	0.90	
Bethany	81	23	54.2	0.98	
Birchtree	83[c]	31[c]	60.1[c]	0.69	
Blue Springs	83	27[d]	57.2[c]	1.46	
Boonville	.....	.....	.....	1.43	
Brunswick	81	29	56.2	1.41	
Carollton	84	26	57.6[c]	0.27	
Caruthersville	88	29	59.7	1.53	
Conception	83	27	56.6	1.08	
Darksville	82	29	55.3	0.80	
Dean	88[n]	29	63.9[c]	1.15	
Desoto	86[c]	28[f]	58.8[f]	1.51	
Doniphan	86	27	58.0	0.54	
Downing	.....	.....	.....	0.15	
Fairport	.....	.....	.....	1.26	
Fayette	82	25	55.4	1.66	
Fulton	85	25	56.6	1.48	
Gallatin [e]	86	30	59.4	1.15	
Gano	85	27	58.1	1.00	
Glasgow	85	29	58.0	1.19	
Gorin	.....	.....	.....	0.34	
Grant City	86	27	56.6	1.26	
Halfway	87	24	57.7	0.17	
Harrisonville	86	25	56.9	0.72	
Hazlehurst	.....	.....	.....	0.98	
Hermann	.....	.....	.....	1.19	
Houston	88	22	57.4	0.41	
Ironton	85	23	55.8	0.89	
Jackson	89	27	58.4	1.09	
Jefferson City	87	28	57.4	1.42	
Joplin	87	30	62.2	1.18	
Kidder	83	27	56.6	1.55	
Koshkonong	87	32	59.4	0.28	
Lamar	88	25	60.6	0.59	
Lamonte	.....	.....	.....	T.	
Lebanon	84	28	57.6	0.52	
Lexington	84	31	58.2	1.98	
Liberty	82	30	57.8	1.71	
Lockwood	87	28	59.4	0.55	
Louisiana	88	25	55.8	0.40	
Macon	84	29	56.8	0.60	
Marblehill	86	28	58.2	1.36	
Marshall	83	27	58.0	1.59	
Maryville	82	27	54.1	1.76	
Mexico	87	27	58.0	0.69	
Miami [o]	82	29	57.1	2.20	
Montreal	87	23	57.0	0.89	
Mountaingrove	84	25	57.8	0.33	
Mount Vernon	90	24	58.8	0.91	
Neosho	88	23	59.8	0.75	
Nevada	.....	.....	.....	0.41	
New Haven	86	28	58.5	1.08	
New Madrid	.....	.....	.....	0.71	
New Palestine	84	29	58.2	1.34	
Oakfield	85	28	58.5	1.03	
Olden	84	24	58.0	0.54	
Oregon	85	25	56.8	0.94	
Palmyra [o]	84	30	57.5	0.50	
Pine Hill	.....	.....	.....	1.73	
Princeton	86	28	56.3	0.26	
Rockport	.....	.....	.....	1.10	
Rolla	.....	.....	.....	1.13	
St. Charles	85	30	59.7	0.48	
St. Joseph	.....	.....	.....	2.02	
Sarcoxie	.....	.....	.....	0.49	
Sedalia	83	28	57.8	0.77	
Seymour	85	27	56.9	0.66	
Sikeston	85	28	58.0	1.07	
Steffenville	82	31	56.8	0.12	
Sublett	81	26	55.6	T.	
Trenton	80	30	55.8	1.09	
Unionville	82	26	55.8	0.20	
Versailles	85	31	58.0	1.25	
Warrensburg	84	32	60.4	0.85	
Warrenton	84	32	56.9	0.52	
Warsaw	85	19	55.8	0.76	
Wheatland	.....	.....	.....	0.20	
Willowsprings	86	23	57.0	0.19	
Zeitonia	87	23	57.0	0.24	
Montana.					
Adel	74	18	45.2	0.59	4.5
Anaconda	76	21	46.8	T.	
Augusta	81	11	47.8	0.10	1.0
Boulder	76	20	45.8	0.09	
Bozeman	75	20	46.2	0.56	1.6
Butte	73	19	47.4	0.05	
Canyon Ferry	80	22	48.4	0.29	T.
Cascade	86	25	52.3	0.47	T.
Chester	82	16[i]	45.5[c]	0.05	
Columbia Falls	78	21[c]	44.0	0.41	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Crow Agency	83	19	50.0	0.65	
Culbertson	83	13	45.8	0.19	
Dayton	78	20	44.2	0.64	
Decker	88	10	49.4	0.30	
Deerlodge	73	16	43.8	.....	
Dillon	75	19	46.0	0.31	T.
Forsyth	84	16	49.8	T.	
Fort Benton	.....	.....	.....	0.09	
Fort Harrison	78	22	48.3	.....	
Glasgow	80	16	43.0	0.22	
Glendive	85	20	46.0	T.	
Grayling	68	9	39.2	1.12	1.0
Greatfalls	80	28	50.6	0.44	T.
Hamilton	79	27	49.0	1.29	T.
Lame Deer	85	19	52.4	0.70	4.0
Livingston	79	28	52.0	0.20	T.
Lewistown	80	17	48.3	T.	T.
Lodge Grass	82	17	49.0	0.48	
Martinsdale	.....	25[d]	48.1[d]	0.40	
Marysville	72[e]	22[e]	44.9[e]	0.07	0.5
Missoula	80	24	48.8	0.68	
Ovando	79	11	44.2	0.11	0.5
Parrot	77	22	49.4	0.22	
Philipsburg	78	21	48.0	0.53	
Plains	81	27	47.8	0.56	
Poplar	84	20	48.6	0.75	
Redlodge	75	15	46.5	0.07	
St. Pauls	85[1]	20[1]	54.6[1]	0.50	T.
St. Peter	78	22	49.8	0.66	3.0
Springbrook	83	13	49.2	0.04	T.
Toston	80	19	49.8	T.	
Townsend	.....	.....	.....	0.00	
Troy	82	23	46.4	0.97	
Twin Bridges	83	13	46.8	T.	T.
Utica	78	24	50.6	0.54	
Wolf Creek	75	24	48.7	0.16	0.2
Yale	79	20	48.8	T.	
Nebraska.					
Agate	78	12	47.6	0.48	T.
Agee *1	82	24	51.1	3.47	
Albion	85[e]	16[e]	51.8[e]	4.16	
Alma	90	23	56.0	5.30	
Ansley	87	22	53.9	3.98	1.0
Arapaho	.....	.....	.....	4.50	
Ashland *a*	87	27	56.6	1.44	
Ashland *b*	.....	.....	.....	1.40	
Auburn	89	24	57.2	3.07	
Aurora	88[f]	26[f]	54.2[f]	4.16	
Bartley	89	21	56.0	2.17	
Beatrice	89	26	58.0	3.28	
Beaver	89	25	57.2	3.83	
Bellevue	.....	.....	.....	0.85	
Bethany	.....	.....	.....	1.57	
Blair	86	25	53.9	2.02	
Bluehill	.....	.....	.....	3.06	T.
Bradshaw	.....	.....	.....	6.08	
Bridgeport	83	13	50.8	0.32	
Broken Bow	87	21	54.2	3.92	
Burchard	.....	.....	.....	5.08	
Burge	.....	.....	.....	0.74	
Burwell	.....	.....	.....	5.51	
Central City	.....	.....	.....	3.61	
Chester	.....	.....	.....	1.37	
Cody	.....	.....	.....	0.30	
Columbus	88	26	54.2	2.96	
Crawford	.....	.....	.....	0.65	
Crete	86	21	53.2	1.76	
Culbertson	88	22	56.2	1.41	
Curtis	83	21	53.0	2.41	
David City	83	28	54.6	2.47	
Dawson	89	25	58.0	2.18	
Duff	.....	.....	.....	2.40	
Dunning	.....	.....	.....	3.50	
Edgar	.....	.....	.....	4.72	
Ericson	.....	.....	.....	4.70	
Ewing	.....	.....	.....	4.85	
Fairbury	89	20	55.5	0.92	
Fairmont	85	21	54.2	3.34	
Fort Robinson	80	18	49.4	0.46	T.
Franklin	88	25	55.6	3.17	T.
Fremont	90	26	54.8	1.54	
Fullerton	.....	.....	.....	3.18	
Geneva	89	25	57.6	3.35	T.
Genoa (near)	85	30	54.5	2.40	
Gering	82	17	52.4	0.73	
Gordon	.....	.....	.....	0.20	
Gothenburg	89	21	54.8	2.85	
Grand Island *a*	87	25	55.4	5.52	
Grant	.....	.....	.....	1.80	
Greeley	.....	.....	.....	6.87	
Guide Rock	.....	.....	.....	2.38	
Haigler	.....	.....	.....	1.35	
Halsey	87	20	54.1	2.13	
Hartington	88	30	57.0	.....	
Harvard	83[e]	25[d]	55.4[e]	3.31	
Hastings *1	84	28	55.4	4.11	T.
Hayes Center	.....	.....	.....	2.22	1.0
Hay Spring	81	20	50.6	3.17	T.
Hebron	88	26	55.9	1.66	
Hickman	.....	.....	.....	1.27	
Holbrook	.....	.....	.....	2.69	
Holdrege	86	25	55.4	3.43	2.0
Holly	.....	.....	.....	0.95	
Hooper *1	86	28	52.8	1.89	
Imperial	86	18	52.0	2.03	
Johnstown	.....	.....	.....	1.26	
Kearney	89	27	56.2	3.86	2.0
Kennedy	89	16	54.4	0.94	
Kimball	79	20	47.7	0.57	4.0
Kirkwood	87	22	52.9	2.22	
Leavitt	90	24	53.2	1.55	
Lexington	89	22	54.1	3.05	4.0
Lockridge	87	26	55.2	2.90	T.
Lodgepole	.....	.....	.....	1.85	
Loup	85	24	53.0	4.69	1.0
Lynch	95	19	56.0	3.40	
McCook	.....	.....	.....	2.60	
McCool	.....	.....	.....	2.10	
Madison	85[s]	24[s]	51.5[s]	3.09	
Marquette	.....	.....	.....	4.08	
Mason	.....	.....	.....	4.68	
Merriman	.....	.....	.....	0.60	
Minden	87	22	54.4	4.64	2.5
Nebraska City	89	26	56.8	1.95	
Nemaha	.....	.....	.....	1.33	
Norfolk	90	24	53.8	4.04	
North Loup	90	25	54.3	4.92	
Oakdale	86	21	51.6	5.26	T.
Odell	.....	.....	.....	2.27	
O'Neill [1]	90	25	53.2	.....	
Ord	.....	.....	.....	4.80	
Osceola	.....	.....	.....	3.41	
Palmer	.....	.....	.....	3.20	
Palmyra *1	86	28	56.0	1.70	
Pawnee City	90	24	57.6	1.23	
Plattsmouth *b*	.....	25	.....	1.77	
Purdum	86	20	53.6	1.98	
Ravenna *a*	88	22	54.3	4.47	1.5
Redcloud	89	23	55.3	1.76	
Republican	.....	.....	.....	3.66	
St. Libory	.....	.....	.....	3.35	
St. Paul	89	22	55.0	2.87	
Santee	90	25	54.6	4.26	
Schuyler	.....	.....	.....	2.45	
Seneca	.....	.....	.....	1.53	
Seward	86	28	55.2	1.58	
Smithfield	.....	.....	.....	3.11	
Springview	85	23	54.4	1.91	
Stanton	84	23	53.0	2.34	
Strang	.....	.....	.....	2.13	
Stratton	.....	.....	.....	2.96	
Stromsburg	.....	.....	.....	3.12	
Superior	87	25	54.8	1.20	
Syracuse	.....	.....	.....	2.57	
Tablerock	.....	.....	.....	2.71	
Tecumseh *b*	.....	.....	.....	3.16	
Tecumseh *c*	.....	.....	.....	2.28	
Tekamah	90	26	55.6	2.05	
Turlington	88	27	56.6	0.88	
University Farm	87	26	57.0	1.53	
Wahoo	.....	.....	.....	2.78	
Wakefield	86	20	52.6	3.10	
Wauneta	.....	.....	.....	2.72	
Weeping Water	.....	.....	.....	1.22	
Westpoint	90	27	54.6	2.18	
Whitman	.....	.....	.....	1.20	
Wilber	.....	.....	.....	1.62	
Wilsonville	.....	.....	.....	2.98	
Wisner	.....	.....	.....	2.87	
Wymore	.....	.....	.....	4.05	
Nevada.					
Battle Mountain	84	24	55.2	1.55	
Belmont	66[e]	21[e]	45.2[e]	0.67	T.
Beowawe *1	69	35	53.3	1.20	
Caliente	91	21	55.5	0.31	
Candelaria	68[e]	26[e]	49.2[e]	1.78	
Carlin *1	76	26	48.6	.....	
Carson City	80	18	48.6	0.93	
Cranes Ranch	.....	.....	.....	2.13	
Dyer	78	18	48.3	0.71	
Eureka	74	19	48.8	0.71	6.0
Fallon	76	30	51.3	0.55	
Geyser	79	15	44.6	0.38	
Golconda	.....	.....	.....	3.32	
Halleck *1	66	18	43.5	2.45	T.
Hawthorne	78	28	52.7	0.13	
Hamilton	71	19	38.7	1.10	11.0
Humboldt	87	25	51.6	1.80	
Lewers Ranch	79	23	50.3	3.60	T.
Lovelocks *1	80	22	50.6	.....	
Martins	.....	.....	.....	0.78	
Mill City	70	35	50.4	1.25	
Palisade	77	20	48.8	2.20	
Palmetto	75	18	46.2	2.17	
Pioche	86	6	46.6	0.77	
Potts	70	14	42.4	1.75	3.5
Reno State University	77	24	49.5	1.08	
San Jacinto	82	17	45.4	0.86	T.
Tecoma	80	9	42.8	1.29	
Toano *1	68	33	43.8	0.27	T.
Wabuska	76	11	45.2	0.60	
Wadsworth	84	22	52.0	.....	
Wells *1	59	24	40.7	1.65	
Wood	.....	.....	.....	0.66	
New Hampshire.					
Alstead	68	19	44.8	2.08	0.5
Berlin Mills	70	12	43.2	0.62	T.
Bethlehem	66	14	42.6	2.88	3.0
Bretton Woods	.....	.....	.....	3.72	
Brookline *1	70	18	46.6	1.24	T.
Chatham	72	11	42.0	3.10	T.
Durham	72	19	45.5	2.35	T.
Franklin Falls	71	19	45.2	1.83	0.2
Grafton	68	15	42.6	2.22	1.0
Hanover	71	16	43.8	2.40	1.0
Jefferson Highland	.....	.....	.....	2.60	
Keene	74	15	45.4	1.95	0.2
Littleton	66	16	41.4	2.81	3.0
Nashua	73	21	47.0	0.94	T.
Newton	74	15	45.8	1.25	T.
North Woodstock	.....	.....	.....	2.41	
Plymouth	67	19	44.2	3.04	
Stratford	68	13	42.7	1.89	1.5
New Jersey.					
Asbury Park	82	30	53.5	2.99	
Bayonne	80	26	52.4	3.45	
Belvidere	83	22	50.6	4.42	
Bergen Point	79	28	52.2	3.88	
Beverly	87	25	53.4	3.72	
Blairstown	79	20	49.4	3.56	
Bridgeton	88	28	55.0	3.25	
Canton	.....	.....	.....	2.92	
Cape May C. H.	84	26	54.3	1.67	
Charlotteburg	78	18	47.8	5.60	
Clayton	86	28	52.2	3.55	
College Farm	81	24	51.5	5.78	
Dover	78	22	47.7	5.23	T.
Elizabeth	.....	.....	.....	5.65	
Englewood	79	25	49.6	2.91	
Flemington	83	25	51.4	5.29	
Friesburg	86	25	53.0	3.53	
Hightstown	80	27	52.4	3.84	
Imlaystown	82	26	53.2	3.25	
Indian Mills	88	23	52.9	3.39	
Lakewood	85	25	52.1	2.48	
Lambertville	82	24	51.7	7.01	
Layton	79	15	47.1	4.05	
Moorestown	84	25	52.6	4.00	
Newark	79	27	51.4	4.16	
New Brunswick	82	27	53.4	5.21	
Oceanic	78	32	53.0	2.60	
Paterson	82	27	52.8	4.39	
Phillipsburg	81	24	50.8	3.80	
Plainfield	80	25	50.3	5.05	
Pleasantville	.....	.....	.....	2.31	
Rancocas	.....	.....	.....	4.44	
Rivervale	75	18	46.8	3.75	
Sandy Hook	79	32	54.0	3.14	
Somerville	80	22	50.4	4.84	
South Orange	77	26	50.2	4.27	
Sussex	77	20	49.8	3.91	
Trenton	81	30	54.8	3.75	
Tuckerton	86	21	51.6	2.04	
Vineland	89	24	52.6	2.76	
Woodstown	.....	.....	.....	3.26	
New Mexico.					
Alamagordo	92	33	60.0	2.38	
Albert	86	32	58.7	1.30	
Albuquerque	.....	.....	.....	0.17	
Alma	86	20	58.6	3.18	
Arabela	78	21	53.3	5.90	
Bellranch	.....	.....	.....	0.69	
Bloomfield	83	24	52.0	1.01	
Cambray	.....	.....	.....	1.48	
Carlsbad	96[e]	33[e]	63.6[e]	1.71	
Cimarron	76	21	50.4	0.57	
Cloudcroft	60	19	41.6	4.37	8.0
Deming	82	31	57.4	2.80	
Dorsey	80	24	50.8	0.54	
Eagle Rock Ranch	72	18	48.6	0.64	3.5
Elk	78	27	53.4	2.80	T.
Engle	83	30	57.9	.....	
Fort Bayard	80	28	53.2	8.18	
Fort Stanton	76	22	50.8	2.68	
Fort Union	80	18	49.7	1.30	
Fort Wingate	78	20	50.4	1.29	
Fruitland	80	20	50.0	1.16	
Hillsboro	80	32	59.3	3.72	
Las Vegas	78	21	49.5	1.08	T.
Lordsburg	.....	.....	.....	0.69	
Los Lunas	82	32	54.4	2.30	
Luna	78	14	47.4	1.90	
Mesilla Park	88	30	60.3	1.52	
Mountainair	74	18	48.7	0.98	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Raton	73	23	51.8	0.60	1.0
Roclada	72	21	47.4	1.39	T.
Roswell	84	20	58.4	2.67	
San Marcial	87	30	59.2	0.50	
San Rafael	77	20	49.2	1.18	
Socorro	79	32	56.4	1.92	
Springer	77	22	52.6	0.05	
Strauss				2.31	
Taos	79	20	51.0	1.26	
Vermejo	71	18	45.0	1.42	6.5
New York.					
Adams				4.82	1.5
Addison	82	15	48.8	1.57	T.
Akron				2.46	
Alden	77	22	48.2	2.75	T.
Ames	78	15	47.2	3.45	T.
Amsterdam	78	18	46.8	3.40	1.2
Appleton	78	21	48.3	2.17	
Arcade	75	20	46.8	3.12	T.
Athens	73	24	48.8	3.83	T.
Atlanta	74	15	47.0	2.79	T.
Atwater				3.63	T.
Auburn	80	19	48.0	2.82	T.
Avon	77	14	46.5	1.56	
Baldwinsville	78	21	47.4	2.83	T.
Ballston Lake	70	18	46.2	3.41	T.
Bedford	75	22	49.0	2.11	
Berlin	72	19	45.8	3.50	T.
Blue Mountain Lake				4.71	1.0
Bolivar	80	12	46.4	2.74	T.
Bouckville	79	18	45.6	3.06	2.0
Boyds Corners				4.00	
Brockport	76	22	48.4	1.87	
Caldwell	69	21	45.2	3.44	T.
Cape Vincent	69	24	46.6	2.65	
Carmel	71	23	47.2	3.64	
Carvers Falls	75	18	45.2	2.88	
Chatham	71	20	47.6	3.50	T.
Chazy	70	18	44.8	3.65	T.
Cooperstown	75	19	44.2	3.49	0.5
Cortland	79	19	47.0	3.29	0.3
Cutchogue	77	29	52.6	2.69	
Deansboro				2.10	T.
Dekalb Junction	75	19	45.2	2.70	4.0
De Ruyter	79	16	46.0	3.20	2.0
Easton				5.43	T.
Elba	74	22	47.5	2.22	T.
Elmira	80	18	48.8	2.01	
Faust	69	14	40.5	3.84	0.2
Fayetteville	82	20	47.6	2.80	T.
Fort Plain	78	23	47.9	2.89	T.
Franklinville	77	17	46.4	6.11	T.
Gabriels	71	8	40.7	5.34	0.7
Gansevoort				3.84	
Glens Falls	70	18	45.8	3.33	0.5
Gloversville	70	18	44.5	3.40	T.
Greenwich	69[c]	20[c]	46.6[c]	3.73	
Griffin Corners	76	12	43.8	4.36	T.
Harkness	73	16	44.1	3.60	1.0
Haskinville				2.47	
Hemlock	76	21	47.6	1.92	
Homer	80	16	45.3	3.01	T.
Hunt	80	14	46.9	2.50	T.
Indian Lake	77	10	41.7	4.25	0.3
Ithaca	81	19	47.2	2.71	0.6
Jamestown	80	17	48.3	3.53	T.
Jeffersonville	80	17	45.8	2.68	T.
Keene Valley	73	13	43.8	3.14	1.0
Lake George	69	20	45.3	3.45	T.
Lenox				2.97	
Le Roy	75	22	47.4	1.87	T.
Liberty	75	20	45.2	4.14	
Littlefalls, City Res.	76	22	45.9	3.48	2.0
Lockport	76	21	48.7	1.81	
Lowville	75	18	43.6	3.31	0.5
Lyndonville				2.08	
Lyons	81	24	49.1	1.93	2.5
Middletown	74	25	49.2	3.98	
Mohonk Lake	73	22	47.2	4.13	
Moira	76	17	44.0	1.58	T.
Newark Valley				3.81	2.0
New Lisbon	77	13	43.6	3.09	0.5
North Hammond	72	22	46.4	1.69	T.
Ogdensburg	72	20	46.3	1.56	T.
Old Chatham				4.02	T.
Oneonta	79	19	47.1	4.45	T.
Oswegatchie	74	20	44.7	3.65	1.8
Otto				3.22	
Oxford	76	17	46.2	3.06	T.
Oyster Bay	76	28	51.4	3.99	
Palermo				4.05	
Perry City	82	14	45.3	3.82	1.2
Plattsburg Barracks				2.86	T.
Port Jervis	80	20	48.8	4.72	
Potsdam	76	17	45.5	2.37	2.0
Primrose	81	20	49.5	2.59	
Redhook				3.90	
Richmondville	77	29	47.0	4.16	T.
Ridgeway	75	24	48.5	2.26	
Ripley	76	30	50.2	4.63	
Rome	80	20	46.4	3.75	T.
Romulus	81	21	48.7	2.31	0.5
Salisbury Mills				4.95	
Saranac Lake	70	13	41.0	4.90	3.2
Saratoga Springs	72	19	46.4	3.46	
Scarsdale	78	21	48.1	1.59	T.
Scottsville				1.61	
Setauket	76	32	52.0	3.10	
Shortsville	80	22	47.8	1.80	0.7
Skaneateles				3.76	
Southampton	74	28	51.4	2.29	
South Butler	82	26	47.5	2.29	
South Canisteo	79	16	47.3	2.46	0.5
Southeast Reservoir				3.61	
South Kortright	77	15	44.8	4.61	T.
South Schroon	72	16	42.5	3.24	0.5
Spier Falls	72	19	47.4	3.01	T.
Straits Corners	80[c]	12[c]	46.7[c]		1.0
Ticonderoga	67	20	45.2	2.35	T.
Volusia	78	23	48.2	4.03	T.
Wappinger Falls	75	22	47.3	4.12	
Warwick				3.38	
Watertown	75	21	46.2	3.96	T.
Waverly	83	15	47.5	2.08	T.
Wedgwood	78	19	45.7	2.02	T.
Wells	73	15	43.7	5.46	T.
West Berne	84[f]	17	45.0[c]	3.58	2.0
Westfield	77	26	49.8	3.91	
Windham	78	16	45.6	3.75	T.
Youngstown				2.01	0.5
North Carolina.					
Brevard	85	18	53.2	0.00	
Brewers	90	20	56.0	0.03	
Bryson City				0.30	
Currituck				1.41	
Eagletown	86	33	57.7	1.90	
Edenton	82	34	57.2	1.90	
Fayetteville	89	35	60.1	2.97	
Goldsboro	86	36	58.8	2.09	
Graham				2.26	
Greensboro	90	30	57.8	1.02	
Henderson	85	32	57.4	2.60	
Hendersonville	84	20	53.8	0.01	
Henrietta	92	26	59.5	0.07	
Horse Cove	80	28	55.3	0.05	
Hot Springs	82	29	59.8		
Jefferson	81	17	51.8	T.	T.
Kinston	86	33	59.7	1.73	
Kittyhawk	82	48	63.4	0.59	
Lenoir	90	22	55.9	T.	
Lexington	90	25	56.8	1.05	
Lincolnton	81	22	54.6		
Linville	73	14	46.4	0.00	
Littleton	88[d]	30[d]	53.8[d]	2.22	
Louisburg	86	32	57.2	2.47	
Lumberton	90	33	60.5	2.96	
Moncure	90	29	58.0	2.71	
Monroe	91	23	57.3	0.98	
Morganton	86	24	56.3	0.92	
Mountairy	89	20	55.8	0.13	
Mount Holly				0.83	
Murphy				T.	
Nashville	90	30	58.5	2.12	
Newbern	89	36	62.2	1.59	
Pantego				1.66	
Patterson	82	22	52.6	0.00	
Pinehurst	90	34	60.6	3.73	
Pittsboro	91	28	60.0	2.44	
Reidsville	88	30	58.6	0.92	
Rockingham	90[d]	33[d]	59.3[d]	4.80	
Salem	89	24	56.0	0.44	
Salisbury	92	23	57.2	1.42	
Saxon	90	22	55.2	0.33	
Scotland Neck	86	35	58.8	1.97	
Settle	90	25	59.0	0.14	
Sloan	88	30	61.3	2.16	
Soapstone Mount	87	28	57.2	1.64	
Southern Pines *a*	93	32	61.4	3.40	
Statesville	90	22	56.8	0.12	
Tarboro	90	32	60.0	1.91	
Washington	88	32	61.0	2.66	
Waynesville	76	19	51.9	T.	
Weldon *a*	91	31	58.6	2.64	
Weldon *b*				2.71	
North Dakota.					
Amenia	74[e]	20[e]	47.2[e]	1.79	T.
Ashley	79	15	46.6	0.91	
Berlin	83	16	47.6	1.37	
Buxton	72	23	46.8	2.81	
Cando	71[e]	17[e]	45.4[e]	0.50	T.
Churchs Ferry	75	18	46.4	1.92	T.
Cooperstown	73[d]	20[d]	46.4[d]	1.65	T.
Devils Lake	75	20	46.4	1.05	T.
Dickinson	87	17	48.3	0.22	T.
Donnybrook	78	19	45.4	0.62	T.
Dunseith	70	18	44.6	0.58	
Edgeley	84	21	47.9	1.01	
Ellendale	78	22	46.6	0.60	
Fargo	72	21	45.9	2.30	
Forman	80	22	48.4	2.41	
Fort Berthold	82	10	46.7	0.40	
Fort Yates	86	25	51.0	0.69	
Fullerton	82	18	47.7	1.26	T.
Glenullin	85[b]	21[b]	47.4[b]	T.	
Hamilton	69	15	43.8	1.20	1.3
Jamestown	80	22	48.0	1.21	
Kulm	81	20	48.6	0.83	T.
Lamoure				1.36	
Larimore	71	17	46.6	1.25	
Lisbon	77	18	47.2	2.07	
McKinney	73	18	44.4	0.20	
Manfred	72	12	45.6	1.57	
Mayville	77	20	49.1	2.71	
Medora	82	19	45.8	0.29	0.2
Melville	78[d]	18[d]	48.2[d]	0.92	
Milton	67	20	44.8	1.56	
Minnewaukon	72	20	46.8	2.16	
Minot	76	25	47.9	T.	
Minto	69	14	43.7	0.87	T.
Napoleon	83	18	47.4	0.45	
New England	82	16	48.1	T.	T.
Oakdale	79	24	48.7	0.20	T.
Pembina	71	18	43.8	0.69	T.
Portal	68	18	42.8	1.06	
Power	76	19	47.0	1.62	
Rolla	71	19	43.9	0.82	T.
Rugby	70	18	44.6	0.21	
Sentinel Butte	81	21	48.2	0.30	T.
Steele	79	22	46.8	0.60	
University	69	21	46.9	2.49	
Wahpeton	75	29	49.8	1.13	T.
Walhalla	67	18	44.2	1.52	T.
Westhope	72	20	45.0	0.12	
Willow City	74	16	44.0	T.	
Wishek	79	20	46.2	0.58	
Ohio.					
Akron	81	22	50.6	1.24	
Amesville	89	19	53.6	1.46	T.
Atwater				1.70	T.
Bangorville	81	28	51.3	1.65	T.
Bellefontaine	82	27	51.8	0.99	T.
Benton Ridge	81	22	51.4	1.70	T.
Bowling Green	81	21	50.6	1.52	
Bucyrus	84	22	51.4	1.61	
Cadiz	82	27	52.8	3.10	T.
Cambridge	86	21	54.4	2.83	
Camp Dennison	89	23	54.4	0.86	
Canal Dover	82	22	50.4	1.81	
Canton	80	23	48.6	1.17	T.
Cardington	82	20	50.0	2.13	
Chillicothe	87	22	55.2	1.48	
Circleville	86	25	53.8	1.58	
Clarington	89	26	55.0	1.88	T.
Clarksville	86	25	55.4	1.29	
Cleveland *a*	79	27	51.7	1.45	T.
Cleveland *b*	80	27	49.8	1.13	T.
Clifton	85	25	54.2	1.02	
Coalton	88	19	54.0	0.54	
Dayton *a*				0.79	
Dayton *b*	86	24	53.6	1.23	
Defiance	80	22	51.6	1.68	T.
Delaware	87	20	51.2	2.26	T.
Demos	84	28	54.0	2.32	T.
Elyria	82	24	49.8		T.
Frankfort	87	22	54.5	0.81	
Fremont	81	23	52.2	1.23	T.
Garrettsville	82	16	49.2	1.43	T.
Gratiot	82	23	52.0	1.53	T.
Green	86	26	54.6	0.25	
Greenfield	83	29	54.3	0.92	
Greenhill	84	16	48.7	1.79	T.
Hanging Rock	88[d]	25[d]	55.6[d]	0.49	
Hedges	80	20	51.0	1.92	
Hillhouse	80	20	49.2	2.60	T.
Hiram	79	26	49.9	1.22	T.
Hudson	82	19	49.6	1.06	
Jacksonburg	88	30	56.3	1.05	
Killbuck	82	23	50.6	1.65	
Lancaster	86	23	52.2	1.29	
Lima	78	25	50.7	2.14	T.
McConnelsville	86	23	53.8	1.58	T.
Manara	85	23	52.4	1.31	
Mansfield				1.30	
Marietta	83	27	55.0	1.28	
Marion	84	20	52.0	1.94	T.
Medina	82	19	50.8	1.06	
Milfordton	81	21	50.8	2.90	
Milligan	86	18	51.8	2.22	
Millport	82	16	50.1	1.74	T.
Montpelier	77	25	49.2	2.05	T.
Napoleon	77	23	52.0	1.47	
Nellie	83	26	52.7	1.67	T.
New Alexandria	85	20	52.6	3.55	T.
New Berlin		22		1.45	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
New Bremen	83	24	52.0	1.54	
New Richmond	85	27	56.6	0.54	
New Waterford	82	18	48.9	0.95	T.
North Lewisburg	82	24	51.6	1.15	
North Royalton	80	28	51.0	1.27	
Oberlin	81	20	50.8	1.59	
Ohio State University	84	23	52.2	1.37	
Orangeville	81	15	49.2	1.23	f.
Ottawa	80	22	51.4	1.82	
Pataskala	84	23	52.5	1.94	
Philo	84	27	54.4	2.38	
Plattsburg	83	28	53.1	2.14	T.
Portsmouth *a*				0.28	
Portsmouth *b*	86	25	55.7	0.28	
Pulse	84	25	54.7	0.92	
Rittman	82	18	49.8	1.01	T.
Rockyridge	81	23	52.2	1.18	T.
Shenandoah	80	20	49.6	1.15	
Sidney	85	23	53.1	0.78	
Somerset	83	29	54.2	2.56	T.
South Lorain	83	18	50.6	1.41	
Springfield				1.84	T.
Thurman	92	22	57.6	0.73	T.
Tiffin	80	26	51.2	1.40	
Upper Sandusky	82	20	52.3	1.94	T.
Urbana	85	24	52.0	2.41	
Vickery	81	20	50.9	1.38	
Warren	82[4]	25	50.6	1.42	T.
Wauseon	79	23	49.4	1.70	T.
Waverly	88	22	55.1	0.61	
Waynesville	84	25	53.1	1.70	
Wellington	82	20	51.1	1.49	
Willoughby				1.24	T.
Wilson	86	20°	53.8	0.39	
Wooster	83	19	50.4	0.87	T.
Zanesville				2.96	
Oklahoma.					
Alva	95	27	64.8	0.51	
Arapaho	99	30	63.8	0.92	
Beaver	91	25	59.8	0.55	
Binger	95	24	62.3	0.43	
Blackburn	88	23	61.0	0.56	
Chandler	91	28	62.8	0.86	
Cleo	95	20	62.6		
Cloud Chief	90	31	62.6	1.00	
Enid	94	25	63.0	1.22	
Erick	100	23	62.6	0.57	
Fort Reno	93	33	62.5	1.75	
Fort Sill	90	38	64.0	T.	
Frederick	93	40	66.9	0.00	
Gage	93	24	61.1	0.77	
Guthrie	89	33	63.8	0.20	
Harrington	93	28	61.4	0.90	
Hennessey	96	32	65.6	1.27	
Hobart	96	32	64.0	0.99	
Jefferson	88	25	61.0	1.03	
Jenkins	95	25	62.4	0.36	
Kenton	84	24	56.6	0.40	T.
Kingfisher	94	29	64.1	0.66	
McComb	90	30	63.0	1.72	
Mangum	98	35	66.5	1.05	
Meeker	90	27	61.8	1.17	
Newkirk	90	31	63.4	0.41	
Norman	94	28	64.6	0.15	
Okeene				1.10	
Perry	93	28	64.0	0.23	
Shawnee	91	32	64.4	1.32	
Stillwater	90	27	62.0	0.13	
Taloga	86	22	59.4	0.85	
Temple	93	30	64.9	0.32	
Waukomis	99	31	65.7	1.05	
Weatherford	96	28	61.0	1.23	
Whiteagle	89	27	62.6	0.20	
Oregon.					
Albany				2.62	
Alpha	85	35	56.6	4.85	
Arlington	86	32	55.0	0.50	
Ashland	86	31	55.0	1.68	
Astoria	70	44	56.4	3.57	
Aurora (near)	80	36	53.6	2.16	
Bay City	79	39	53.8	5.61	
Bend	84	22	49.0	0.74	
Beulah	73	21	47.8	1.60	
Blackbutte	76	32	50.8	5.10	
Blalock	91	35	58.2	0.35	
Bullrun				3.70	
Burns	81	20	49.0	0.86	
Butter Creek				0.68	
Cascade Locks	83	38	56.2	3.33	
Coquille				5.20	
Corvallis	84	35	54.1	2.74	
Dayville	80	29	51.8	0.89	
Doraville	78	38	53.6	2.39	
Drain	87	40	57.2	3.41	
Ella				0.42	
Fairview	84	38	57.8	6.47	
Falls City	74	33	51.2	3.35	
Forestgrove	86	33	54.5	2.61	
Gardiner	78	40	55.4	4.53	
Glendale	90	34	58.1	3.32	
Glenora	77	30	51.8	7.14	
Gold Beach	79	34	54.0	8.17	
Government Camp	74	29	47.8	4.65	8.0
Grants Pass	93	32	55.6	2.29	
Grass Valley	85	28	49.4	1.11	
Heppner	82	32	52.0	0.97	
Hood River	82	35	53.9	2.02	
Huntington	83	27	52.4	0.91	
Jacksonville	88	32	56.4	2.09	
John Day	89	29	52.8	1.24	T.
Joseph	78	28	49.6	1.93	T.
Kerby	90	30	54.8	5.13	
Klamath Falls	86	17	49.7	1.65	
Lagrande	84	29	51.1	2.02	
Lakeview	80	20	48.2	1.43	
Lonerock	86	29	51.5	1.15	
McKenzie Bridge	88	28	53.1	4.43	
McMinnville	83	35	54.9	2.11	
Meacham				1.67	
Monroe	81	37	55.6	2.91	
Mount Angel	84	41	57.2	2.87	
Nehalem				5.38	
Newport	78	42	54.8	4.48	
Ontario				0.55	
Pendleton	86	28	52.2	1.04	
Pine	83	23	49.0	1.57	
Prineville	81	25	49.6	0.67	
Riverside	86	20	50.0	0.98	
Salem	80	40	55.2	2.82	
Silverlake	81	10	44.4	0.56	
Sparta	80	30	51.4	1.30	
Stafford	84	37	55.3	3.16	
The Dalles	84	34	54.3	1.44	
Toledo	84	34	55.2	5.34	
Umatilla	87	32	55.5	0.60	
Vale	84	20	49.8	1.31	
Wallowa	81	24	49.8	1.65	
Wamic	85	28	54.4	1.41	
Warm Spring	90	28	53.2	0.85	
Weston	89	24	50.4	2.10	
Williams	92	27	54.8	1.38	
Pennsylvania.					
Aleppo	86	19	53.2	1.39	
Altoona	83	19	49.4	1.43	
Beaver Dam				1.54	
Bellefonte	84	21	51.1	2.06	
Brookville				2.09	
Browers				4.86	
California	87	24	55.2	1.46	
Cassandra	78	20	47.3	1.87	T.
Clarion				1.70	
Claysville	84	19	52.3	1.80	T.
Coatsville	87	22	52.0	6.18	
Confluence				1.53	
Coudersport	77	14	46.2	2.48	T.
Davis Island Dam				1.48	
Derry	86	19	52.3	2.56	
Doylestown				5.59	
Dushore	78	15	45.6	2.15	T.
East Bloomsburg				3.24	
East Mauch Chunk	79	20	49.8	4.49	
Easton	78	25	50.4	3.57	
Ellwood Junction				1.68	
Emporium	79	20	48.8	2.08	T.
Ephrata	83	21	51.6	2.92	
Everett	84	18	48.5	1.67	T.
Forks of Neshaminy				7.11	
Franklin	84	16	51.2	1.26	
Freeport	88	21	52.8	1.77	
Gettysburg	84	28	53.4	2.50	
Girardville				4.42	
Gordon	79	15	46.4	3.80	
Greensboro				1.36	
Greenville	81	19	49.9	1.37	T.
Hamburg	88	23	51.0	3.56	
Hanover *c*	87	23	52.6		
Herrs Island Dam				1.93	
Huntingdon *a*				1.80	
Huntingdon *b*	88	18	50.8	1.91	
Indiana	83	24	51.1	2.10	T.
Irwin	91	20	55.1	2.82	T.
Johnstown	85	23	52.8	2.84	T.
Keating				1.62	
Kennett Square	81	25	51.4	3.98	
Lansdale				4.76	
Lawrenceville	83	14	46.1	2.24	T.
Lebanon	85	22	51.2	3.06	
Leroy	81	19	47.4	2.58	T.
Lewisburg	82	19	50.0	2.69	
Lockhaven *a*	87	19	51.6	1.92	
Lockhaven *b*				1.40	
Lock No. 4				1.39	
Lycippus	83	30	53.6	1.45	T.
Marion	85	22	50.2	2.39	
Mifflin				0.70	
Mifflintown	85	13	49.8	2.32	
Milford	78	18	47.4	4.56	
Montrose	78	15	45.8	4.26	T.
New Germantown	86	18	51.5	2.35	
Oil City				1.64	
Ottsville				4.50	
Parker				2.18	
Philadelphia	83	31	54.8	4.03	
Pocono Lake	73	15	44.4	3.66	
Point Pleasant				4.67	
Pottsville				3.45	
Quakertown	81	22	51.0	3.82	
Reading	82	23	52.1	3.67	
Saegerstown	83	15	49.0	3.15	T
St. Marys	75	18	47.6	3.10	
Saltsburg				2.24	
Seisholtzville				4.62	
Selinsgrove	86	20	52.0	2.40	T.
Shawmont				4.37	
Skidmore	81°	21°	51.2°	1.77	T.
Smethport	78	12	47.5	2.81	T.
Smiths Corners				3.95	
Somerset	79	20	49.6	1.91	T.
South Eaton	80	21	48.6	3.54	
Springmount				3.78	
State College	79	24	50.2	2.18	
Swarthmore	83	26	52.4	4.17	
Towanda	81	17	48.2	3.18	
Troutrun				1.80	
Uniontown	85	23	54.0	1.27	T.
Warren	78	18	48.6	2.38	
Wellsboro	77°	18[5]	48.1°		
Westchester	84	27	53.0	5.47	
West Newton				1.58	
Wilkesbarre	79	22	49.0	3.68	
Williamsport	83	23	51.0	2.24	T.
Rhode Island.					
Bristol	67	26	50.5	1.68	
Kingston	78	20	48.2	2.30	
Pawtucket	76	26	49.2	2.67	T.
Providence *a*	75	26	50.5	2.11	
Providence *c*	76	24	49.4	2.30	
South Carolina.					
Aiken	95	37	67.5	T.	
Allendale	88	40	66.2	1.27	
Anderson	95	35	65.2	0.24	
Barksdale	85	33	62.6	0.62	
Batesburg	92	34	65.3	0.66	
Beaufort	86	44	67.4	1.00	
Bennettsville	90	32	62.4	0.90	
Blackville	93	34	64.5	0.68	
Bowman	92	30	63.0	0.43	
Calhoun Falls				0.52	
Camden				1.40	
Cheraw *a*	90	34	59.6	2.26	
Cheraw *b*				2.40	
Clarks Hill	98	35	63.4	0.16	
Clemson College	90	27	60.6	0.00	
Conway	86	36	62.4	2.30	
Darlington	90	31	63.0	1.02	
Dillon	90	35	61.7	3.01	
Duewest	88	37	63.3	0.60	
Edisto				0.34	
Effingham				1.19	
Florence	90	31	61.4	1.26	
Gaffney	94	28	60.4	0.04	
Georgetown	83	40	64.8	2.85	
Greenville	86	26	56.8	T.	
Greenwood	88	33	60.6	0.40	
Heath Springs	89	31	59.5	1.36	
Kingstree *a*	87	36	63.2	1.69	
Kingstree *b*				1.65	
Liberty	89	28	60.8	T.	
Little Mountain	91	35	62.0	0.77	
Newberry	90	30	61.2	0.37	
Pelzer				0.90	
Pinopolis *e* [1]	82	40	63.0	2.84	
St. Georges	87	37	63.6	0.17	
St. Matthews	86	38	62.8	0.25	
St. Stephens				1.63	
Saluda	91°	27[d]	60.6[4]	0.41	
Santuck	92	26	59.7	0.38	
Seivern	93	28	59.6	1.09	
Smiths Mills				3.90	
Society Hill	84	34	59.8	2.06	
Spartanburg	91	30	60.7	0.83	
Statesburg	88	38	63.0	1.30	
Summerville	85	37	63.0	1.64	
Trenton	87	37	62.8	0.19	
Trial	90	30	63.1	1.31	
Walhalla	88	30	59.8	0.00	
Walterboro	89	35	65.6	1.54	
Winnsboro	90	36	62.7	0.87	
Winthrop College	90	33	60.4	0.55	
Yemassee	89	36	64.2	1.07	
Yorkville	92	34	62.0	1.06	
South Dakota.					
Aberdeen	82	21	52.8	0.30	
Academy	87	27	54.9	2.25	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alexandria	80	21	52.3	2.15	
Armour	89	23	54.8	2.30	
Ashcroft	88	18	46.6	0.63	
Bowdle	77	21	50.4	0.25	
Brookings	80	17	49.2	3.15	
Canton	86	21	52.4	4.96	
Cavite	89	19	53.8	0.77	
Centerville	.....	.....	.....	4.62	
Chamberlain	88	26	56.4	0.94	
Cheyenne	81	22	53.0	0.20	
Clark	78	19	50.2	1.25	
Clear Lake	75	23	49.0	1.33	
DeSmet	85	19	48.9	3.47	
Doland	80	19	52.0	1.46	
Elkpoint	89	24	53.8	4.40	
Fairfax	87	22	54.1	2.51	
Farmingdale	.....	.....	.....	0.53	
Faulkton	78	24	51.0	0.30	
Flandreau	80	22	49.4	2.89	
Forestburg	86	20	52.5	2.68	
Fort Meade	86	21	51.4	1.86	T.
Gannvalley	87	25	52.6	1.25	
Grand River School	86	22	51.4	0.86	
Greenwood	91	23	56.6	3.01	
Herreid	83	20	50.4	0.40	
Highmore	84	22	53.2	0.60	
Hotch City	87	21	54.4	0.53	
Howard	81	21	52.0	2.30	
Howell	85	21	51.2	0.48	
Ipswich	78	19	49.2	0.84	T.
Kidder	81	18	49.1	0.54	T.
Kimball	85	21	51.2	1.54	
Leola	93	19	50.8	0.50	
Leslie	90	18	54.6	0.34	
Marion	85	22	53.0	2.65	
Mellette	82	22	51.1	0.53	T.
Menno	87	23	53.8	3.92	
Millbank	80	22	49.2	2.54	
Mitchell	88	24	53.3	2.33	
Oelrichs	77	19	46.8	1.30	T.
On-the-Trees Camp	84	21	52.0	0.45	
Pine Ridge	80	19	48.2	.....	
Plankinton	85[d]	23[e]	53.4[d]	2.34	
Ramsey	82	19	51.2	3.72	
Redfield	83	21	50.8	0.60	
Rosebud	75	25	47.7	T.	
Silver City	.....	.....	.....	0.72	
Sioux Falls	84	24	53.2	3.32	
Sisseton Agency	76	23	48.6	1.78	
Spearfish	81	25	53.0	2.77	
Stephan	86	18	53.0	0.01	
Tyndall	89	20	54.4	4.71	
Vermillion	89	23	53.6	6.67	
Watertown	76	22	48.6	2.24	T.
Wentworth	87	23	51.3	3.79	
Wolsey	.....	.....	.....	1.51	
Tennessee.					
Andersonville	85	23	57.3	0.12	
Arlington	87	29	59.2	0.40	
Ashwood	88	28	59.2	1.79	
Benton	88	25	58.2	0.05	
Bluff City	.....	.....	.....	T.	
Bolivar	87	28	58.8	0.29	
Bristol	84	23	55.0	T.	
Brownsville	85	33	59.4	0.67	
Byrdstown	88	29	58.8	0.99	
Carthage	90	30	60.0	0.70	
Cedar Hill	89	29	59.8	1.01	
Celina	.....	.....	.....	1.11	
Charleston	.....	.....	.....	0.06	
Clarksville	86	30	59.0	0.40	
Clinton	.....	.....	.....	T.	
Covington	86	31	59.6	0.55	
Decatur	88	24	57.6	0.05	
Dickson	89[b]	27[b]	60.8[b]	0.31	
Dover	91	26	59.4	0.46	
Dyersburg	85	34	59.6	1.00	
Elizabethton	87	29	55.6	0.02	
Erasmus	86	22	54.4	0.34	
Florence	85	29	58.6	2.18	
Franklin	85	29	58.1	0.50	
Grace	.....	.....	.....	0.70	
Greeneville	84	26	57.2	T.	
Halls Hill	.....	.....	.....	1.35	
Harriman	85	27	57.8	0.17	
Hohenwald	88	21	57.2	1.46	
Iron City	88	26	58.6	0.64	
Isabella	82	25	56.1	0.01	
Jackson	88	28	60.0	0.62	
Johnsonville	88	26	58.4	0.98	
Jonesboro	84	22	55.6	0.17	
Kenton	86	26	58.6	0.94	
Kingston	.....	.....	.....	T.	
Lafayette	89	24	58.8	0.80	
Leadvale	.....	.....	.....	0.20	
Lewisburg	90	28	59.9	1.72	
Loudon	.....	.....	.....	0.20	
Lynnville	88	30	58.8	1.13	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.	
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*	
McMinnville	86	26	58.2	1.35		
Maryville	87	27	59.0	0.41		
Milan	86	29	58.2	1.35		
Monterey	81	.....	.....	0.30		
Mountain City	74	20	50.0	0.13		
Newport	83	27	57.4	T.		
Nunnelly	90	24	58.2	1.81		
Palmetto	87	30	59.1	2.03		
Pope	85[i]	26	57.6[f]	2.22		
Rogersville	86	25	57.6	0.24		
Rugby	87	20	54.8	0.69		
Savannah	90	28	61.7	0.63		
Sewanee	82	32	59.0	0.83		
Springdale	85	21	55.8	0.30		
Springville	88	24	57.6	0.59		
Tazewell	.....	.....	.....	0.35		
Tellico Plains	90	25	59.4	T.		
Tracy City	88	24	55.0	0.83		
Trenton	88	26[k]	59.6[f]	1.26		
Tullahoma	86	27	57.6	1.63		
Walling	.....	.....	.....	0.51		
Waynesboro	92	26	60.2	0.59		
Wildersville	83	31	58.2	2.90		
Yukon	87	34	61.2	0.89		
Texas.						
Albany	98	38	68.5	1.34		
Alvin	.....	.....	.....	1.44		
Arthur	.....	.....	.....	2.58		
Athens	100	34	69.8	1.00		
Austin	93	46	70.9	4.01		
Ballinger	92	34	66.3	1.41		
Beaumont	.....	.....	.....	3.25		
Beeville	96	48	73.2	2.51		
Bigspring	93[m]	31[m]	63.6[m]	0.50		
Blanco	93	36	67.2	2.69		
Boerne	90	40	67.4	2.50		
Bonham	95	38	67.4	2.38		
Booth	.....	.....	.....	1.66		
Bowie	98	36	67.6	3.29		
Brazoria	92	41	72.3	3.16		
Brenham	95	47	71.3	2.00		
Brighton	89	47	74.0	8.29		
Brownwood	98	36	70.2	0.81		
Burnet	95	40	69.3	3.63		
Childress	94	32	63.6	0.85		
Clarendon	90	27	60.7	1.85		
Claytonville	91	33	64.4	2.91		
Coleman	98	42	71.6	2.93		
College	100	46	73.0	3.07		
Colorado	91	32	65.2	1.93		
Columbia	90	40	70.8	2.28		
Columbus	.....	.....	.....	3.30		
Comanche	.....	.....	.....	6.14		
Comstock	88	40	70.4	1.11		
Corsicana	98	44	71.0	3.29		
Crockett	100	38	71.0	0.67		
Cuero	92	46	71.2	4.25		
Dallas	99	40	68.0	4.36		
Danevang	96	43	72.2	6.10		
Decatur	99	43	72.4	2.05		
Dialville	92	45	69.4	0.59		
Dublin	96	41	68.8	5.00		
Duval	94	46	70.8	3.32		
Estelle	100	39	68.9	4.60		
Fort Brown	94	50	76.4	1.38		
Fort Clark	89	43	69.8	2.00		
Fort Davis	83	28	58.4	3.05	4.3	
Fort McIntosh	96	42	73.3	1.05		
Fort Ringgold	94	44	74.2	1.46		
Fort Stockton	90	33	62.8	2.03		
Fredericksburg	91	39	67.2	2.89		
Gainesville	97	35	66.0	3.97		
Gatesville	.....	.....	.....	5.05		
Georgetown	100	41	69.8	4.81		
Graham	101	33	68.4	1.61		
Grapevine	102	41	70.4	5.70		
Greenville	100	41	70.3	1.85		
Hale Center	89	30	62.0	0.40		
Hallettsville	93	44	71.6	5.68		
Haskell	95	35	67.3	1.02		
Hearne	99	41	71.8	4.10		
Hempstead	.....	.....	.....	2.59		
Hewitt	.....	.....	.....	3.67		
Hillsboro	98	36	68.6	5.12		
Hondo	90	47	70.0	2.37		
Houston	94	45	72.6	1.00		
Huntsville	101	44	70.6	1.54		
Ira	91	35	65.0	1.70		
Jefferson	92	34	66.0	0.13		
Jewett	98	35	67.1	1.60		
Junction	.....	.....	.....	2.17		
Kaufman	98	41	69.2	4.15		
Kent	88	30	60.5	2.26		
Kerrville	92	33	66.2	4.19		
Knickerbocker	93	29	66.4	2.55		
Lampasas	96	34	66.2	3.61		
Lapara	.....	.....	.....	7.25		
Laureles Ranch	.....	.....	.....	3.62		

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Liberty	.....	.....	.....	1.70	
Llano	94	42	68.1	4.80	
Longview	95	40	66.6	0.22	
Luling	91	47	70.2	3.46	
McKinney	98	39	67.1	4.11	
Marlin	100	42	70.4	4.40	
Menardville	93	28	64.2	2.62	
Mexia	97	44	70.0	3.32	
Midland	88	30	63.2	0.62	
Mount Blanco	90	29	61.2	1.06	
Nacogdoches	95	37	68.4	0.33	
New Braunfels	90	45	70.0	2.84	
Orange	.....	.....	.....	1.90	
Panter	.....	.....	.....	6.78	
Paris	98	34	66.8	1.25	
Pearsall	94	47	72.5	1.65	
Pierce	96	44	71.9	4.56	
Port Lavaca	94	46	73.0	6.53	
Rhineland	92	38	65.0	0.68	
Riverside	.....	.....	.....	1.73	
Rockisland	.....	.....	.....	5.37	
Rockland	95	54	75.6	1.78	
Rockport	88	58	73.2	6.05	
Runge	97	47	72.8	3.12	
Sabinal	91	41	69.7	1.65	
San Marcos	93	42	69.4	3.43	
San Saba	93	35	66.3	5.43	
Santa Gertrudes Ranch	.....	.....	.....	5.07	
Sherman	92	43	66.7	3.48	
Sonora	89	29	65.3	2.86	
Sugarland	92	41	71.0	1.60	
Sulphur Springs	97	40	68.0	1.54	
Temple *a*	94	42	68.2	3.70	
Temple *b*	96	41	68.0	3.60	
Texline	82	25	54.3	0.17	
Tilden	99	39	74.8	1.66	
Trinity	102	39	71.0	2.18	
Tulia	86	24	58.0	1.18	
Tyler	.....	.....	.....	1.08	
Victoria	95	47	72.4	4.95	
Waco	99	43	71.9	6.43	
Waxahachie	102	37	67.4	4.72	
Weatherford	97	38	67.6	7.73	
Wharton	97	41	71.4	3.29	
Wichita Falls	.....	.....	.....	0.60	
Utah.					
Alpine	.....	.....	.....	1.72	
Aneth	85	27	53.5	0.50	
Beaver	80[g]	14[g]	45.0[g]	0.67	
Blackrock	79	16	46.0	0.65	T.
Callao	83	15	49.0	0.76	
Castledale	79	14	45.6	1.35	
Castle Rock	.....	.....	.....	1.03	
Cisco	78	22	51.0	0.47	
Corinne	85	27	52.6	0.80	T.
Coyoto	70	7	40.5	0.10	
Desert	82	10	46.8	0.32	
Emery	58	20	39.0	0.75	
Escalante	87	24	49.6	0.46	
Farmington	85	26	49.9	2.02	T.
Fillmore	92	21	54.4	0.62	
Fort Duchesne	78	18	47.7	0.44	T.
Frisco	77	24	49.7	0.41	T.
Garrison	80	15	47.6	0.94	
Giles	82	18	50.8	0.34	
Government Creek	81	21	49.0	1.04	T.
Heber	80	17	47.2	1.22	
Henefer	81	15	47.0	1.29	T.
Hite	91	32	59.7	0.36	
Huntsville	.....	.....	.....	2.04	
Ibapah	80	15	44.6	1.70	
Indianola	.....	.....	.....	0.50	
Kanab	83	18	48.2	0.80	
Kelton	71	21	45.8	3.00	
La Sal	74	16	45.2	1.04	
Levan	77	21	47.4	0.98	0.8
Loa	73	15	42.2	.....	
Logan	80	25	52.6	1.57	
Manti	78[c]	19[c]	46.9[c]	0.94	
Marysvale	81	14	47.2	0.40	
Meadowville	74	20	44.2	1.60	T.
Millville	.....	.....	.....	1.29	
Minersville	82	20	50.2	T.	
Moab	84	24	55.1	0.63	
Monticello	76	29	53.0	1.36	
Morgan	85	18	47.5	1.18	1.0
Mount Nebo	80	20	50.2	0.25	
Mount Pleasant	91	21	48.9	0.88	
Nephi	.....	.....	.....	1.07	T.
Ogden	77	25	51.4	1.78	.....
Panquitch	.....	.....	.....	0.20	
Parowan	82	21	47.6	0.74	0.2
Payson	.....	.....	.....	1.23	.....
Pinto	77	18	45.3	0.91	
Plateau	79	11	44.2	0.35	0.3
Promontory	.....	.....	.....	T.	T.
Provo	84	23	50.8	1.56	.....
Ranch	76	20	46.6	T.	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rockville	95	26	62.7	0.42	
St. George	97	29	59.4	0.19	
Salt Air	74	30	51.4	1.02	2.0
Scipio	84	14	48.6	0.95	T.
Snowville	80	21	48.0	2.21	
Soldier Summit	73	7	40.6	1.21	2.0
Thistle	74	20	46.6	0.27	1.5
Tooele	78	27	51.5	0.75	
Tropic	80	19	50.4	T.	
Utah Lake	.....	.....	.....	0.84	T.
Wellington	81[f]	18[f]	47.4[f]	0.80	
Woodruff	74	12	43.0	1.66	
Vermont.					
Burlington	69	25	47.9	3.29	T.
Cavendish	74	15	44.9	2.67	T.
Chelsea	61	14	40.6	1.77	3.0
Chittenden	.....	.....	.....	4.30	
Cornwall	68	23	47.3	2.94	T.
Derby	66	20	40.4	2.54	
Enosburg Falls	73	13	43.1	3.04	T.
Jacksonville	70	15	43.7	3.33	1.0
Manchester	70	19	44.8	3.19	T.
Morrisville	69	12	42.2	3.19	2.0
Norwich	69	14	41.7	3.01	1.5
St. Johnsbury	69	15	44.0	1.81	T.
Wells	68	16	43.4	3.38	
Westfield	72	11	42.0	4.19	4.0
Woodstock	70	14	41.4	2.98	1.0
Virginia.					
Ashland	88	29	55.3	2.45	
Barboursville	87	25	56.0	0.73	
Bedford	.....	35	.....	0.54	
Bigstone Gap	81	27	55.3	0.98	
Blacksburg	84	16	52.4	0.13	T.
Buchanan	.....	.....	.....	0.28	
Buckingham	92	21	54.6	0.78	
Burkes Garden	.....	.....	.....	.....	T.
Callaville	90	31	56.4	2.60	
Charlottesville	92	32	58.6	0.61	
Clarksville	.....	.....	.....	0.68	
Columbia	87	25	54.4	0.91	
Dale Enterprise	87	24	55.2	1.12	
Danville	.....	.....	.....	0.92	
Dinwiddie	90	23	55.0	3.09	
Elk Knob	79	33	57.4	1.00	
Fredericksburg	86	26	54.0	1.75	
Grahams Forge	79	17	51.0	0.05	T.
Hampton	85	36	59.4	1.80	
Hot Springs	79	21	50.0	0.43	T.
Ivanhoe	.....	.....	.....	0.01	
Lexington	89	21	53.5	0.46	
Lincoln	93	19	53.3	1.84	
McDowell	85	21	55.0	0.08	T.
Mendota	.....	.....	.....	0.24	
Newport News	83	37	59.2	1.52	
Petersburg	89	30	57.0	2.12	
Radford	.....	.....	.....	T.	
Riverton	.....	.....	.....	1.58	
Roanoke	93	24	58.0	.....	
Rockymount	.....	.....	.....	0.36	
Saxe	94	24	57.1	1.54	
Shenandoah	.....	.....	.....	1.63	
Speers Ferry	.....	.....	.....	0.70	
Spottsville	88	29	56.2	2.30	
Staunton	86	25	55.7	0.95	T.
Stephens City	91	22	55.2	1.53	
Warsaw	88[e]	29[e]	57.8[e]	2.80	
Wilkerson	88	31	56.4	2.49	
Williamsburg	80	29	54.9	.....	
Woodstock	92	23	56.1	1.10	
Wytheville	85	18	54.2	0.02	T.
Washington.					
Aberdeen	80	36	54.6	3.92	
Anacortes	.....	.....	.....	1.35	
Ashford	.....	.....	.....	2.50	
Bellingham	70	33	52.2	1.88	
Blaine	67	33	50.8	2.29	
Brinnon	70	36	52.4	4.12	
Cedonia	81	28	49.6	0.64	
Centralia	87	35	54.8	1.54	
Cheney	71	21	51.0	0.75	
Clearbrook	78	30	51.2	2.65	
Clearwater	69	37	52.4	7.52	
Cle Elum	86	24	49.2	1.63	
Colfax	84	27	52.0	1.58	
Colville	86	24	46.7	2.13	
Conconully	80	27	47.4	2.27	
Coupeville	72	38	54.3	0.89	
Crescent	84	24	48.7	0.63	
Cusick	81	21	46.4	0.66	
Danville	81	27	47.4	0.83	
Dayton	86	30	54.6	0.88	
East Sound	69[d]	34[d]	50.8[d]	1.41	
Ellensburg	87	24	49.4	0.19	
Ephrata	87	32	54.8	0.30	
Granite Falls	.....	.....	.....	3.09	
Horseheaven	.....	.....	.....	0.27	
Lacenter	79	34	53.0	2.80	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lakeside	81	30	49.8	1.60	
Lester	80[f]	35[f]	53.7[f]	.....	
Lind	81	30	55.2	0.35	
Loomis	85	32	53.1	2.30	
Mottinger Ranch	90	35	57.0	0.66	
Mount Pleasant	81	40	56.4	3.02	
Moxee	88	25	51.4	0.47	
Northport	78	21	44.6	1.40	
Odessa	76	23	51.4	0.22	
Olga	64	39	51.5	1.97	
Olympia	74	33	53.9	2.33	
Pinehill	87	33	54.3	2.00	
Pomeroy	83	30	53.4	0.54	
Port Townsend	67	40	53.0	0.67	
Pullman	79[b]	34[b]	53.0[b]	2.06	
Rattlesnake	79[e]	34[e]	49.8[e]	0.46	
Republic	81	22	46.0	0.83	
Ritzville	.....	.....	.....	0.19	
Ritzville (near)	.....	.....	.....	0.44	
Rosalia	81	29	51.2	1.53	
Sedro	69	34	52.8	2.18	
Snohomish	68	38	53.6	2.35	
Snoqualmie	74	38	52.9	5.19	
Southbend	80	35	58.0	3.34	
South Ellensburg	80	24	48.8	0.75	
Sprague	.....	.....	.....	0.20	
Sunnyside	83	29	51.7	0.22	
Trinidad	88	35	56.4	0.40	
Twisp	83	26	49.5	2.26	
Union	73[f]	34[f]	52.4[f]	3.70	
Vancouver	81	37	55.4	2.23	
Vashon	66	41	52.9	1.52	
Waterville	82	30	48.8	0.79	
Wenatchee (near)	83	32	50.8	0.05	
Wilbur	81	18	48.4	0.42	
Zindel	90[e]	30[e]	57.4[e]	1.38	
West Virginia.					
Bancroft	89	28	57.7	1.11	
Bayard	79	16	47.4	2.35	0.5
Bens Run	88	27	55.5	1.14	
Beverly	84	19	49.4	2.10	1.0
Bluefield	87	25	57.8	.....	
Burlington	88	18	51.2	1.44	
Cairo	89	18	55.8	1.75	T.
Central	87	20	53.6	1.19	
Charleston	85	30	58.4	1.65	
Creston	86[b]	20[b]	54.2[b]	0.37	
Cuba	83	21	54.5	0.83	
Doane	87	27	57.8	1.51	
Elkhorn	81	25	54.4	1.18	
Fairmont	.....	.....	.....	1.78	
Glenville	89	20	54.9	1.00	
Grafton	84	24	54.9	1.55	
Green Sulphur Springs	86	16	53.0	0.40	
Hamlin	92	20	56.2	1.50	
Harpers Ferry	.....	.....	.....	1.55	
Hinton	.....	.....	.....	0.54	
Huntington	87	25	54.9	0.64	
Lewisburg	81	19	51.8	0.65	T.
Logan	85	30	60.5	2.52	
Lost Creek	91	17	56.6	1.80	
Mannington	85	20	52.4	1.48	
Martinsburg	89	25	53.3	2.45	
Moorefield	92	19	55.0	0.68	
Morgantown	84	30	55.6	1.74	T.
Moundsville	88	25	55.4	1.60	
New Cumberland	85	21	52.2	1.25	
New Martinsville	88	26	55.4	2.01	
Nuttallburg	85	35	59.2	0.85	
Parsons	83	19	51.0	2.91	T.
Philippi	84	17	51.0	1.74	T.
Point Pleasant	87	26	58.6	0.42	
Princeton	80	20	51.8	0.85	T.
Romney	89	20	52.7	1.59	
Rowlesburg	.....	.....	.....	2.25	
Ryan	86	20	53.4	1.61	
Southside	88	24	55.8	0.66	
Uppertract	88	20	54.0	1.14	T.
Valley Fork	85	23	53.8	1.51	
Wellsburg	79	26	51.8	3.02	
Weston	88	20[f]	57.4[e]	1.02	
Wheeling *a*	.....	.....	.....	1.94	T.
Wheeling *b*	85	32	57.9	1.52	T.
Williamson	89	30	58.0	2.22	
Wisconsin.					
Amherst	74	19	49.8	3.82	T.
Antigo	75	22	46.0	5.52	0.5
Appleton	78	25	49.8	3.48	0.5
Appleton Marsh	75	18	48.0	2.63	1.2
Ashland	.....	.....	.....	5.89	
Barron	72	22	49.4	5.61	2.5
Beloit	76	26	51.3	2.57	
Berlin	78	21	48.2	3.32	T.
Brodhead	79	23	52.0	2.34	
Burnett	77	23	49.4	2.38	0.8
Butternut	73	20	44.4	4.59	T.
Chilton	78	21	48.8	4.25	0.8
Darlington	78	18	49.8	2.20	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Wisconsin—Cont'd.	°	°	°	*Ins.*	*Ins.*
Downing	75	20	47.4	7.44	1.0
Easton	77	15	49.2	4.21	0.5
Eau Claire	75	21	49.8	5.46	T.
Florence	70	18	43.8	4.56	0.2
Fond du Lac	78	21	49.0	3.18	T.
Grand Rapids	74	20	47.9	4.74	2.0
Grand River Locks	.....	.....	.....	5.42	1.5
Grantsburg	72	21	47.0	5.04	2.0
Hancock	74	20	48.0	4.20	2.0
Harvey	76	23	50.0	2.85	T.
Hayward	70	18	44.4	5.73	2.0
Hillsboro	76	18	48.8	3.71	T.
Koepenick	74	20	44.6	5.50	
Lancaster	78	22	50.0	3.13	
Madison	74	29	50.7	1.71	
Manitowoc	75	25	48.7	3.63	T.
Meadow Valley	77	17	47.8	3.26	1.5
Medford	72	23	46.5	8.00	1.0
Menasha	.....	.....	.....	3.93	T.
Minocqua	63	22	43.5	5.08	T.
Mount Horeb	77	22	48.7	1.64	T.
Neillsville	74	20	48.3	5.32	2.0
New London	76	20	47.6	4.03	T.
Oconto	73	22	47.1	2.42	T.
Osceola	75	15	47.0	5.32	T.
Oshkosh	75	23	49.6	3.01	T.
Pine River	78	20	48.8	4.36	0.4
Portage	77	25	50.6	2.25	
Port Washington	75	20	47.2	3.73	
Prairie du Chien *a*	85	23	55.4	2.27	T.
Prairie du Chien *b*	.....	.....	.....	2.26	.....
Racine	80	27	52.6	1.47	
Sheboygan	75	27	50.5	3.07	T.
Stanley	76	21	47.9	4.93	2.0
Stevens Point	80	19	50.4	5.26	1.6
Tomahawk	74	22	48.4	5.60	T.
Valley Junction	77	18	49.0	3.22	0.2
Viroqua	76	22	49.6	4.22	1.2
Watertown	75	21	49.3	1.84	T.
Waukesha	73	27	49.8	3.28	T.
Wausau	78	24	47.0	5.24	
Whitehall	76	20	48.9	3.12	T.
Wyoming.					
Afton	77	20	45.0	1.00	4.5
Alcova	73	21	48.6	1.90	2.0
Basin	79	21	50.9	0.54	
Border	75	10	42.4	1.22	2.0
Buffalo	80	14	46.8	0.26	T.
Cambria	83	20	53.0	0.39	T.
Centennial	.....	.....	.....	0.45	
Daniel	68	11	37.5	1.28	.....
Embar	77	17	47.8	1.24	3.0
Evanston	73	20	43.5	1.23	1.0
Fort Laramie	89	16	50.2	0.73	
Fort Washakie	77	16	48.3	1.73	
Griggs	80	18	48.8	1.31	3.0
Iron Mountain	72	16	44.8	0.09	0.3
Kirtley	78	19	48.4	0.08	0.8
Laramie	70	7	43.0	0.54	3.0
Leo	70	17	42.8	1.20	7.0
Little Medicine	70	11	40.6	0.61	13.0
Lolabama Ranch	68	15	42.1	0.37	.....
Lusk	80	15	47.2	0.00	
Meeteetse	78	15	47.4	1.25	3.0
Moore	75	17	47.6	0.60	3.4
Moorcroft	88	21	54.8	0.09	
Phillips	79	21	49.1	0.55	4.0
Pine Bluff	81	19	48.6	0.20	2.0
Sheridan	.....	.....	.....	0.15	
South Pass City	70	— 4	39.6	0.58	4.9
Wells	64[h]	12	39.6[f]	1.07	1.8
Yellowstone Park (C. H.)	68	0	38.0	1.27	11.0
Yellowstone Pk. (Foun'n)	64	.....	42.4[g]	0.65	.....
Yellowstone Pk. (Lake)	64	10	39.4	0.95	5.0
Yellowstone Pk. (U. Ba'n)	70	16	40.4	0.80	8.0
Porto Rico.					
Adjuntas	90	56	72.8	10.65	
Aguirre	99	70	81.8	12.31	
Arecibo	93	58	76.8	3.87	
Bayamon	90	64	77.1	5.60	
Canovanas	89	70	79.3	10.08	
Coamo	91	64	79.0	9.61	
Carozal	96	66	80.8	6.45	
Fajardo	91	66	78.8	13.55	
Guanica	90	63	77.0	8.80	
Hacienda Colosa	91	67	78.7	7.61	
Hacienda Josefa	.....	.....	.....	15.72	
Humacao	88	73	80.9	18.80	
Juana Diaz	88	.....	.....	15.43	
La Carmelita	85	65	74.7	17.13	
Lares	91	60	75.6	6.37	
Manati	97	65	79.4	4.32	
Maunabo	94	68	79.8	22.54	
Mayaguez	94	65	78.4	9.52	
Rio Blanco	90	65	78.0	25.78	
Rio Piedras	.....	.....	.....	6.89	
San Lorenzo	92	63	77.0	14.92	
San Salvador	86	62	74.2	10.25	

TABLE II.—*Climatological record of voluntary and other cooperating observers. Late reports for September*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Porto Rico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Santa Isabel	91	66	78.6	11.96	
Vieques	90	70	80.2	8.74	
Yauco	88	69	78.0	12.38	
New Brunswick.					
St. John	62	27	44.8	4.48	
Late reports for September, 1904.					
Alaska.					
Chestochena	71	15	40.0	2.01	
Coal Harbor	64	33	48.4	3.73	
Copper Center	67	6	40.1	0.73	1.0
Fort Liscum	70	30	44.7	7.96	
Kenai	75	11	44.6	4.01	
Ketchemstock	64	0	32.2	0.64	0.5
Loring	72	34	50.6	20.20	
Skagway	67	32	47.4	2.80	
Sunrise	70	20	44.2	2.33	
Tanana	63	3	29.8	1.06	1.0
Teikhill	70	11	40.4	1.21	0.5
Wood Island	65	40	50.2	4.63	
Wrangell	67	35	50.6	18.22	
Arizona.					
Huachuca Reservoir	.....	.....	.....	1.30	
Arkansas.					
Clarendon	.....	.....	.....	0.84	
California.					
Indio	112	67	85.4	0.00	
Newcastle	105	55	76.1	3.86	
Sonora	94	52	73.3	3.34	
Willits	.....	.....	.....	2.25	
Illinois.					
Albion	92	43	69.6	5.86	
Iowa.					
Maquoketa	90	30	62.0	3.99	
Northwood	.....	.....	.....	1.40	
Kansas.					
Newton	100	40	71.3	2.08	
Yates Center	95	38	71.2	1.37	
Louisiana.					
Caspiana	99[4]	57[4]	79.8[4]	5.36	
Maine.	°	°	°	*Ins.*	*Ins.*
Chesuncook	.....	.....	.....	7.71	T.
Grant Farm	.....	.....	.....	7.85	
Massachusetts.					
Concord	84	25	59.5	5.19	
Michigan.					
Detour	75	33	54.5	5.66	
Grand Marais	74	33	52.6	5.22	
Minnesota.					
Mankato	.....	.....	.....	3.33	
St. Cloud	81	30	58.4	3.02	
Montana.					
Billings	99	29	61.5	.....	
Columbia Falls	.....	.....	.....	0.95	
Nebraska.					
Wakefield	95	33	62.6	1.74	
New Hampshire.					
Bartlett	.....	.....	.....	5.53	
Breton	.....	.....	.....	7.81	
Jefferson Highlands	.....	.....	.....	6.06	
North Woodstock	.....	.....	.....	7.58	
New Mexico.					
Fort Bayard	88	40	64.8	2.81	
Fort Wingate	81	38	62.4	0.67	
Lordsburg	.....	.....	.....	3.09	
North Carolina.					
Brewers	92	43	68.0	1.20	
Fayetteville	90	44	72.0	.....	
Oregon.					
John Day	.....	.....	.....	0.98	
Paisley	91[6]	37[4]	62.5[4]	.....	
Rhode Island.					
Pawtucket	84	34	61.8	8.00	
South Dakota.					
Gann Valley	109	32	64.6	0.21	
Tennessee.					
Grace	.....	.....	.....	1.60	
Texas.					
Clarendon	95	55	75.0	0.50	
San Marcos	95	64	79.2	2.54	
Washington.					
Colville	91	25	56.4	0.57	
Porto Rico.					
Corozal	94	70	82.4	4.13	
Mexico.					
Coatzacoalcos	.....	.....	.....	11.44	
Vera Cruz	89	70	79.8	4.57	

EXPLANATION OF SIGNS.

• Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. + 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "[n]" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

June, 1904, Oregon, Bend, make minimum and mean temperatures 29 and 60.2 instead of 25 and 57.7 respectively; July, 1904, make minimum and mean temperatures 34 and 65.6° instead of 24 and 60.6°, respectively; July, 1904, Montana, Dayton, make mean temperature 70 4 instead of 70.2.

NOTE.—The following changes have been made in names of stations: Colorado, Parachute, changed to Grand Valley; Mississippi, Swartwout, changed to Pecan; New Mexico, Maxwell, near, changed to Cimarron.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of October, 1904.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	18	18	5	35	w.	30
Portland, Me	16	25	5	29	s. 69 w.	26
Concord, N. H.†	12	10	8	10	n. 45 w.	3
Northfield, Vt	20	31	6	17	s. 45 w.	16
Boston, Mass	19	16	8	29	n. 82 w.	21
Nantucket, Mass	30	18	12	24	n. 81 w.	12
Block Island, R. I	24	15	9	23	n. 57 w.	17
Narragansett, R. I.*	9	4	5	19	n. 70 w.	15
New Haven, Conn	26	10	10	26	n. 45 w.	23
Middle Atlantic States.						
Albany, N. Y	29	27	5	16	n. 80 w.	11
Binghamton, N. Y.†	9	5	14	11	n. 37 e.	5
New York, N. Y	22	15	11	23	n. 60 w.	14
Harrisburg, Pa	19	17	17	21	n. 63 w.	4
Philadelphia, Pa	25	17	13	23	n. 51 w.	13
Scranton, Pa	19	22	11	26	s. 79 w.	15
Atlantic City, N. J	29	14	7	23	n. 47 w.	22
Cape May, N. J	29	16	9	15	n. 25 w.	14
Baltimore, Md	28	15	11	19	n. 32 w.	15
Washington, D. C	22	17	19	20	n. 11 w.	5
Cape Henry, Va.†	13	12	7	3	n. 76 e.	4
Lynchburg, Va	17	16	17	19	n. 63 w.	2
Norfolk, Va	27	16	21	10	n. 45 e.	16
Richmond, Va	28	21	11	16	n. 36 w.	9
Wytheville, Va	20	9	14	31	n. 57 w.	20
South Atlantic States.						
Asheville, N. C	21	24	17	18	s. 18 w.	3
Charlotte, N. C	24	15	32	8	n. 69 e.	26
Hatteras, N. C	37	6	32	7	n. 39 e.	4
Raleigh, N. C	35	11	9	16	n. 16 w.	25
Wilmington, N. C	38	6	28	6	n. 34 e.	39
Charleston, S. C	38	5	28	5	n. 35 e.	40
Columbia, S. C	30	7	30	12	n. 38 e.	29
Augusta, Ga	36	6	25	11	n. 25 e.	33
Savannah, Ga	36	6	27	6	n. 35 e.	37
Jacksonville, Fla	44	2	22	7	n. 20 e.	45
Florida Peninsula.						
Jupiter, Fla	26	10	31	7	n. 36 e.	29
Key West, Fla	36	5	28	10	n. 30 e.	36
Sand Key, Fla.†	18	1	16	6	n. 30 e.	20
Tampa, Fla	44	1	28	11	n. 22 e.	46
Eastern Gulf States.						
Atlanta, Ga	19	7	33	15	n. 56 e.	22
Macon, Ga.†	22	1	9	6	n. 8 e.	21
Pensacola, Fla.†	21	0	14	4	n. 25 e.	23
Birmingham, Ala.†	13	3	17	5	n. 50 e.	16
Mobile, Ala	42	6	10	11	n. 2 w.	36
Montgomery, Ala	36	4	28	8	n. 32 e.	38
Meridian, Miss.†	18	3	14	3	n. 36 e.	19
Vicksburg, Miss	26	8	28	9	n. 47 e.	26
New Orleans, La	34	5	31	7	n. 40 e.	38
Western Gulf States.						
Shreveport, La	22	16	29	13	n. 69 e.	17
Fort Smith, Ark	11	10	36	14	n. 87 e.	22
Little Rock, Ark	28	13	25	14	n. 36 e.	19
Corpus Christi, Tex	25	14	27	11	n. 56 e.	19
Fort Worth, Tex	20	20	21	14	e.	7
Galveston, Tex	21	17	29	10	n. 78 e.	19
Palestine, Tex	26	18	27	8	n. 67 e.	21
San Antonio, Tex	21	19	29	9	n. 84 e.	20
Taylor, Tex.†	13	11	12	5	n. 74 e.	7
Ohio Valley and Tennessee.						
Chattanooga, Tenn	23	19	17	19	n. 27 w.	4
Knoxville, Tenn	28	17	10	20	n. 42 w.	15
Memphis, Tenn	32	13	22	8	n. 36 e.	24
Nashville, Tenn	26	20	15	14	n. 9 e.	6
Lexington, Ky.†	9	13	11	8	s. 37 w.	5
Louisville, Ky	27	19	7	17	n. 51 w.	13
Evansville, Ind.†	14	9	7	9	n. 22 w.	5
Indianapolis, Ind	19	26	13	16	s. 23 w.	8
Cincinnati, Ohio	23	18	16	18	n. 22 w.	5
Columbus, Ohio	19	23	12	18	s. 56 w.	7
Pittsburg, Pa	26	17	11	23	n. 53 w.	15
Parkersburg, W. Va	21	21	15	19	w.	4
Elkins, W. Va	29	13	5	22	n. 47 w.	23
Lower Lake Region.						
Buffalo, N. Y	17	21	16	22	s. 56 w.	7
Oswego, N. Y	16	29	12	19	s. 28 w.	15
Rochester, N. Y	12	23	10	31	s. 62 w.	24
Syracuse, N. Y	10	28	8	23	s. 40 w.	23
Erie, Pa	15	29	11	18	s. 27 w.	16
Cleveland, Ohio	17	29	13	15	s. 9 w.	12
Sandusky, Ohio†	6	15	3	12	s. 45 w.	13
Toledo, Ohio	17	25	10	25	s. 59 w.	18
Detroit, Mich	17	18	12	28	s. 87 w.	16
Upper Lake Region.						
Alpena, Mich	21	20	12	26	n. 86 w.	14
Escanaba, Mich	22	20	6	28	n. 85 w.	22
Grand Rapids, Mich	14	26	18	14	s. 18 e.	13
Houghton, Mich.†	11	5	11	8	n. 27 e.	7
Marquette, Mich	20	17	13	28	n. 79 w.	15
Port Huron, Mich	14	25	14	25	s. 45 w.	16
Sault Ste. Marie, Mich	21	13	23	21	n. 14 e.	3
Chicago, Ill	12	28	10	26	s. 45 w.	23
Milwaukee, Wis	18	17	11	24	n. 86 w.	13
Green Bay, Wis	16	24	11	24	s. 58 w.	15
Duluth, Minn	31	8	17	22	n. 12 w.	24
North Dakota.						
Moorhead, Minn	19	21	22	18	s. 63 e.	4
Bismarck, N. Dak	26	11	24	16	n. 28 e.	17
Williston, N. Dak	23	18	19	22	n. 31 w.	6

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
Upper Mississippi Valley.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Minneapolis, Minn.*	11	10	10	6	n. 76 e.	4
St. Paul, Minn	22	22	15	20	w.	5
La Crosse, Wis.†	7	14	6	7	s. 8 w.	7
Davenport, Iowa	12	19	19	25	s. 41 w.	9
Des Moines, Iowa	15	25	18	22	s. 22 w.	11
Dubuque, Iowa	15	22	15	23	s. 49 w.	11
Keokuk, Iowa	14	22	17	22	s. 32 w.	9
Cairo, Ill	26	19	20	11	n. 52 e.	11
Springfield, Ill	15	23	17	19	s. 14 w.	8
Hannibal, Mo.†	6	11	10	13	s. 31 w.	6
St. Louis, Mo	9	24	25	17	s. 28 e.	17
Missouri Valley.						
Columbia, Mo.*	5	13	11	8	s. 21 e.	8
Kansas City, Mo	10	26	21	15	s. 21 e.	17
Springfield, Mo	14	25	23	12	s. 45 e.	16
Topeka, Kans.*	8	16	5	7	s. 14 w.	8
Lincoln, Nebr	18	28	16	15	s. 6 e.	10
Omaha, Nebr	18	29	13	18	s. 24 w.	12
Valentine, Nebr	19	20	9	30	s. 87 w.	21
Sioux City, Iowa†	11	11	10	9	e.	1
Pierre, S. Dak	19	13	23	20	n. 27 e.	7
Huron, S. Dak	22	22	20	16	e.	4
Yankton, S. Dak.†	8	10	9	12	s. 56 w.	4
Northern Slope.						
Havre, Mont	18	11	17	31	n. 63 w.	16
Miles City, Mont	24	14	5	26	n. 65 w.	23
Helena, Mont	13	21	2	44	s. 79 w.	43
Kalispell, Mont	9	18	6	38	s. 74 w.	33
Rapid City, S. Dak	21	10	9	35	n. 67 w.	28
Cheyenne, Wyo	27	16	6	30	n. 65 w.	26
Lander, Wyo	15	24	10	26	s. 61 w.	18
Yellowstone Park, Wyo	8	36	3	31	s. 45 w.	40
North Platte, Nebr	15	21	10	26	s. 69 w.	17
Middle Slope.						
Denver, Colo	15	28	20	6	s. 47 e.	19
Pueblo, Colo	21	15	25	18	n. 49 e.	9
Concordia, Kans	16	33	9	14	s. 16 w.	18
Dodge, Kans	13	28	15	18	s. 11 w.	15
Wichita, Kans	15	30	18	9	s. 31 e.	18
Oklahoma, Okla	16	24	22	12	s. 51 e.	13
Southern Slope.						
Abilene, Tex	15	29	21	11	s. 36 e.	17
Amarillo, Tex	15	29	18	16	s. 8 e.	14
Southern Plateau.						
El Paso, Tex	23	7	35	15	n. 51 e.	26
Santa Fe, N. Mex	22	18	26	14	n. 72 e.	13
Flagstaff, Ariz	30	6	24	17	n. 16 e.	25
Phoenix, Ariz	10	13	28	23	s. 59 e.	6
Yuma, Ariz	27	13	13	24	n. 38 w.	18
Independence, Cal	24	19	11	26	n. 72 w.	16
Middle Plateau.						
Carson City, Nev	18	16	16	27	n. 80 w.	11
Winnemucca, Nev	24	17	23	15	n. 49 e.	11
Modena, Utah	4	2	20	38	n. 84 w.	18
Salt Lake City, Utah	15	22	19	18	s. 8 e.	7
Grand Junction, Colo	25	15	18	20	n. 11 w.	10
Northern Plateau.						
Baker City, Oreg	12	32	25	16	s. 24 e.	22
Boise, Idaho	23	19	16	25	n. 66 w.	10
Lewiston, Idaho†	4	10	20	3	s. 71 e.	18
Pocatello, Idaho	2	28	28	17	s. 23 e.	28
Spokane, Wash	15	19	30	10	s. 79 e.	20
Walla Walla, Wash	6	33	18	14	s. 8 e.	27
North Pacific Coast Region.						
North Head, Wash	16	27	23	10	s. 50 e.	17
Port Crescent, Wash.*	7	9	14	10	s. 63 e.	4
Seattle, Wash	22	16	14	21	n. 49 w.	9
Tacoma, Wash	34	15	4	18	n. 36 w.	24
Tatoosh Island, Wash	3	23	33	11	s. 48 e.	30
Portland, Oreg	17	25	13	25	s. 56 w.	14
Roseburg, Oreg	23	12	18	20	n. 10 w.	11
Middle Pacific Coast Region.						
Eureka, Cal	19	18	13	21	n. 83 w.	8
Mount Tamalpais, Cal	27	12	15	24	n. 31 w.	18
Red Bluff, Cal	27	20	18	15	n. 23 e.	8
Sacramento, Cal	22	21	22	11	n. 85 e.	11
San Francisco, Cal	5	12	4	47	s. 80 w.	41
Point Reyes Light, Cal.*	18	5	1	14	n. 45 w.	18
Southeast Farallon, Cal.*	16	5	1	20	n. 60 w.	22
South Pacific Coast Region.						
Fresno, Cal	30	15	12	22	n. 34 w.	18
Los Angeles, Cal	16	13	16	30	n. 78 w.	14
San Diego, Cal	33	5	12	28	n. 12 w.	29
San Luis Obispo, Cal	30	16	11	20	n. 33 w.	17
West Indies						
Basseterre, St. Kitts, W. I	14	13	41	3	n. 88 e.	38
Bridgetown, Barbados	3	25	46	2	s. 63 e.	49
Cienfuegos, Cuba	40	10	28	4	n. 39 e.	38
Colon, Panama, S. A.†	6	23	7	3	s. 13 e.	18
Curaçao, W. I	2	13	54	2	s. 78 e.	53
Grand Turk, W. I.†	3	15	20	2	s. 56 e.	22
Hamilton, Bermuda	27	15	28	8	n. 59 e.	23
Havana, Cuba†	6	5	20	2	n. 87 e.	18
Kingston, Jamaica†	17	4	11	4	n. 28 e.	15
Port of Spain, Trinidad†	1	15	23	1	s. 58 e.	26
Puerto Principe, Cuba	23	16	35	1	n. 78 e.	35
Roseau, Dominica, W. I.†	13	18	13	7	n. 50 e.	8
San Juan, Porto Rico	3	42	25	8	s. 24 e.	42
Santiago de Cuba, Cuba	36	15	19	4	n. 35 e.	26
Santo Domingo, Santo Domingo	34	19	11	7	n. 15 e.	16
Honolulu, H. I						

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, October, 1904.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	60	T.				1	3	2																										6	2	T.
		A.																																0	0	A.
Arizona	56	T.		5	2	2	8	6	1	2														1					3				30	9	T.
		A.																																0	0	A.
Arkansas	57	T.				7	18	3				6	1	1																				36	6	T.
		A.																																0	0	A.
California	167	T.			1	8	9	6	3	10		1				4																	42	8	T.
		A.																																0	0	A.
Colorado	70	T.					1	8		6	1			4			2																22	6	T.
		A.																																0	0	A.
Connecticut	21	T.													2																		0	0	A.
		A.																																2	1	A.
Delaware	5	T.							2																								2	1	T.
		A.																																2	1	A.
Dist. of Columbia	4	T.											1																				1	1	T.
		A.																																1	1	A.
Florida	61	T.	6		4	6	4	4	2	3	2	1	1	3	4				..	1	1						1			1			44	16	T.
		A.																																0	0	A.
Georgia	67	T.			1			2							1																		4	3	T.
		A.																																0	0	A.
Idaho	34	T.						8	8	7	1							1															25	5	T.
		A.																																0	0	A.
Illinois	84	T.				8	17	2	3	9	4	11	4									1	9										68	10	T.
		A.		1						1	1										1			1		1								7	7	A.
Indiana	58	T.					1			7	2	8	4										17										39	6	T.
		A.			1		2																											1	1	A.
Indian Territory	20	T.						1																										3	2	T.
		A.																																0	0	A.
Iowa	128	T.	1		1	10	15	1	2	5	16	9							11	13	25	2	1										112	14	T.
		A.																																1	1	A.
Kansas	88	T.	2	2	2	10	5					2			5	2				5	4	2				1								41	11	T.
		A.																																0	0	A.
Kentucky	41	T.					2	1						1																				6	5	T.
		A.																					1	1										0	0	A.
Louisiana	46	T.				1	2	4	1				1																				9	5	T.
		A.																																0	0	A.
Maine	25	T.																																9	5	T.
		A.																																0	0	A.
Maryland	42	T.				1		3	10	1				1	1	1																	0	0	T.
		A.					1						3	1																			18	7	A.
Massachusetts	48	T.																													1		5	3	T.
		A.																																1	1	A.
Michigan	106	T.					1	5	8						2	2											1							1	1	T.
		A.				15	13	2	1	1	4	16	3																				18	5	A.
Minnesota	67	T.			1			1						1		1					1	3											59	10	T.
		A.			3					8	5	10	2			5	5	4	2		4	1											4	4	A.
Mississippi	57	T.					1								1																		49	11	T.
		A.		1			2	2																										2	2	A.
Missouri	86	T.	1			9	10			4		2																					5	3	T.
		A.																																0	0	A.
Montana	54	T.		1				2	1	2	1										4												30	6	T.
		A.						1	2																								1	1	A.
Nebraska	137	T.	1	2				1	2							2						1											7	5	T.
		A.			2	6			2	6	8	2		7	3			1	12	20	4	1											7	4	A.
Nevada	40	T.																															75	14	T.
		A.					1	3					2	1	2	2	1	2	2		1		1			2	1						0	0	A.
New Hampshire	21	T.																															21	13	T.
		A.																																0	0	A.
New Jersey	48	T.						3	5																								0	0	T.
		A.					1						4	2																			10	3	A.
New Mexico	31	T.																					1										6	3	T.
		A.		1				2	3							1																	0	0	A.
New York	129	T.																															9	5	T.
		A.					2			6	2	15	9	1																2			0	0	A.
North Carolina	56	T.					1	3	2	1						1		1				2											37	7	T.
		A.					1		6																								9	6	A.
North Dakota	48	T.									1																						7	2	T.
		A.													1	6	2	9	1														0	0	A.
Ohio	101	T.		1			2	1																							1	1	21	7	T.
		A.					21			12	2	29	11			1		1													2	1	6	4	A.
Oklahoma	36	T.			5	1	3						1									1		15									93	9	T.
		A.												4	2					2	1												2	2	A.
Oregon	70	T.						2	4	3	1		1			2	1							1									19	8	T.
		A.																																0	0	A.
Pennsylvania	91	T.					10	3					3	7																	2	1	17	9	T.
		A.																						2									0	0	A.
Rhode Island	6	T.																															25	5	T.
		A.																																0	0	A.
South Carolina	54	T.			1			2	1																								0	0	A.
		A.						9												1	1												2	1	A.
South Dakota	56	T.			1			1		1	2	3			3	1		3	1	2	1												13	5	T.
		A.							1																								0	0	A.
Tennessee	56	T.					10					2								1													19	11	T.
		A.																																1	1	A.
Texas	126	T.		3	1	2	1		1			1	5	3	4		1		1	4	2												13	3	T.
		A.																																0	0	A.
Utah	64	T.					1	16	2	1	8	2	2	1										8	10	3		1		3	1	55	19	T.
		A.																																0	0	A.
Vermont	12	T.																															33	8	T.
		A.																																0	0	A.
Virginia	40	T.						2	4					1								2											0	0	A.
		A.																																9	4	A.
Washington	71	T.								1	1																						0	0	T.
		A.															1																0	0	A.
West Virginia	47	T.																															3	3	T.
		A.				7	4	1			1	2	1				1																0	0	A.
Wisconsin	63	T.	1	3	7	19	2		11	8	22	14	1										1										18	8	T.
		A.																			2												0	0	A.
Wyoming	38	T.						2						1								1											90	11	T.
		A.						2	1	1	1		2																				4	3	A.
																																	7	5	T.
Sums	2993	T.	12	16	32	105	173	95	64	100	89	125	54	38	26	25	14	22	30	51	49	10	33	5	0	26	13	5	0	5	4	5	1	1,227	....	T.
		A.	0	4	1	1	5	24	32	3	1	0	1	2	10	7	0	1	0	0	1	0	4	1	0	2	0	0	0	0	3	1	1	165	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during October, 1904, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.												
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	21	6:54 a. m.	1:50 p. m.	2.18	10:50 a. m.	11:50 a. m.	1.00	0.05	0.13	0.21	0.26	0.32	0.35	0.39	0.46	0.55	0.69	0.85	.....	.....	.....
Alpena, Mich.	9	.....	.....	0.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.21	.....	.....	.....
Amarillo, Tex.	17	.....	.....	0.18	.....	.....	.....	.....	.....	0.16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Asheville, N. C.	6	.....	.....	0.02	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atlanta, Ga.	2	.....	.....	0.10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.06	.....	.....	.....
Atlantic City, N. J.	21	.....	.....	0.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.33	.....	.....	.....
Augusta, Ga.	6	.....	.....	0.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....
Baltimore, Md.	21	12:50 a. m.	7:55 a. m.	2.10	4:43 a. m.	6:05 a. m.	0.83	0.06	0.14	0.31	0.43	0.52	0.58	0.64	0.68	0.73	0.79	0.86	1.09	.....	.....
Binghamton, N. Y.	21	.....	.....	1.22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Birmingham, Ala.	5	.....	.....	0.23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.09	.....	.....	.....
Bismarck, N. Dak.	16	7:00 p. m.	10:48 p. m.	1.15	7:15 p. m.	7:57 p. m.	0.03	0.05	0.22	0.46	0.57	0.68	0.74	0.83	0.92	0.95	.....	.....	.....	.....	.....
Block Island, R. I.	21	.....	.....	0.56	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.20	.....	.....	.....
Boise, Idaho.	7	.....	.....	0.34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Boston, Mass.	12–13	.....	.....	0.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Buffalo, N. Y.	10–11	.....	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.37	.....	.....	.....
Cairo, Ill.	5	.....	.....	0.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.55	.....	.....	.....
Cape Henry, Va.	20–21	.....	.....	1.74	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Charleston, S. C.	20	10:25 a. m.	10:35 p. m.	3.91	3:25 p. m.	4:15 p. m.	1.33	0.05	0.13	0.16	0.26	0.37	0.40	0.42	0.45	0.61	0.69	.....	.....	.....	.....
					4:15 p. m.	5:25 p. m.	.....	0.77	0.82	0.89	0.96	1.03	1.06	1.20	1.37	1.45	1.54	1.78	1.95	.....	.....
Charlotte, N. C.	25–26	.....	.....	0.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.27	.....	.....	.....
Chattanooga, Tenn.	2	.....	.....	0.22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.13	.....	.....	.....
Chicago, Ill.	4–5	11:50 p. m.	5:05 a. m.	0.97	12:51 a. m.	1:20 a. m.	0.01	0.08	0.17	0.24	0.35	0.59	0.67	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati, Ohio.	10	10:30 p. m.	11:00 p. m.	0.51	10:37 p. m.	10:47 p. m.	0.01	0.33	0.49	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland, Ohio.	11	.....	.....	0.19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.15	.....	.....	.....
Columbia, Mo.	1	.....	.....	1.23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.51	.....	.....	.....
Columbia, S. C.	26	D. N.	2:15 p. m.	1.97	7:03 a. m.	8:00 a. m.	0.10	0.09	0.18	0.23	0.26	0.30	0.35	0.53	0.74	0.84	0.91	1.04	.....	.....	.....
Columbus, Ohio.	10	.....	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.24	.....	.....	.....
Concord, N. H.	21	.....	.....	0.83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.34	.....	.....	.....
Corpus Christi, Tex.	25	.....	.....	0.87	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.43	.....	.....	.....
Davenport, Iowa.	5	.....	.....	0.56	.....	.....	.....	.....	.....	0.56	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denver, Colo.	17–18	.....	.....	0.39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....
Des Moines, Iowa.	8	.....	.....	0.25	.....	.....	.....	.....	0.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit, Mich.	10	.....	.....	0.35	.....	.....	.....	.....	.....	0.25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dodge, Kans.	17	.....	.....	0.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Dubuque, Iowa.	4–5	7:40 p. m.	2:50 a. m.	1.12	12:07 a. m.	12:30 a. m.	0.34	0.32	0.50	0.60	0.71	0.75	.....	.....	.....	.....	.....	.....	.....	.....	.....
Duluth, Minn.	9	.....	.....	1.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.46	.....	.....	.....
Eastport, Me.	21	.....	.....	0.91	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Elkins, W. Va.	11–12	.....	.....	0.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Erie, Pa.	10	3:39 p. m.	7:49 p. m.	1.75	4:18 p. m.	4:38 p. m.	0.08	0.25	0.49	0.65	0.73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Escanaba, Mich.	9	.....	.....	1.65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.57	.....	.....	.....
Evansville, Ind.	21	.....	.....	0.19	.....	.....	.....	.....	0.09	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fort Smith, Ark.	4	.....	.....	0.58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Fort Worth, Tex.	24–26	.....	.....	5.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....
Fresno, Cal.	6	D. N.	7:02 p. m.	2.10	4:20 a. m.	5:10 a. m.	0.07	0.07	0.15	0.18	0.25	0.30	0.36	0.62	0.76	0.85	0.90	.....	.....	.....	.....
Galveston, Tex.	25	.....	.....	0.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.39	.....	.....	.....
Grand Junction, Colo.	6	.....	.....	0.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.21	.....	.....	.....
Grand Rapids, Mich.	9	.....	.....	0.34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.24	.....	.....	.....
Green Bay, Wis.	3–4	.....	.....	1.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.45	.....	.....	.....
Hannibal, Mo.	10	.....	.....	0.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.20	.....	.....	.....
Harrisburg, Pa.	21	.....	.....	1.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.52	.....	.....	.....
Hatteras, N. C.	29	.....	.....	0.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.29	.....	.....	.....
Huron, S. Dak.	9	.....	.....	1.02	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Indianapolis, Ind.	10–11	.....	.....	0.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.53	.....	.....	.....
Jacksonville, Fla.	3	4:45 p. m.	5:30 p. m.	1.28	4:45 p. m.	5:15 p. m.	0.00	0.13	0.52	0.77	1.11	1.20	1.26	.....	.....	.....	.....	.....	.....	.....	.....
Do.	4	12:44 p. m.	10:30 p. m.	1.35	2:32 p. m.	3:00 p. m.	0.25	0.13	0.24	0.41	0.60	0.74	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do.	7	10:41 a. m.	5:05 p. m.	1.92	10:41 a. m.	11:06 a. m.	0.00	0.13	0.32	0.57	0.68	0.73	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do.	28	7:40 a. m.	5:00 p. m.	1.09	12:06 p. m.	12:37 p. m.	0.22	0.08	0.25	0.41	0.56	0.63	0.69	0.74	.....	.....	.....	.....	.....	.....	.....
Jupiter, Fla.	8	7:02 a. m.	11:45 a. m.	1.35	7:12 a. m.	7:31 a. m.	0.01	0.40	0.71	0.84	0.91	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do.	12	6:46 a. m.	10:15 a. m.	0.80	6:48 a. m.	7:02 a. m.	0.01	0.22	0.60	0.67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do.	16–18*	.....	.....	15.27*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Kalispell, Mont.	6–7	.....	.....	0.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.08	.....	.....	.....
Kansas City, Mo.	1	.....	.....	0.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.33	.....	.....	.....
Key West, Fla.	6	.....	.....	0.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.45	.....	.....	.....
Knoxville, Tenn.	11	.....	.....	0.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.03	.....	.....	.....
La Crosse, Wis.	7	.....	.....	0.53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.35	.....	.....	.....
Lewiston, Idaho.	15	.....	.....	0.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Lexington, Ky.	11	.....	.....	0.30	.....	.....	.....	.....	0.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lincoln, Nebr.	18	.....	.....	0.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.23	.....	.....	.....
Little Rock, Ark.	5	.....	.....	0.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Los Angeles, Cal.	8–9	.....	.....	0.44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.31	.....	.....	.....
Louisville, Ky.	11	.....	.....	0.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.07	.....	.....	.....
Lynchburg, Va.	20–21	.....	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.12	.....	.....	.....
Macon, Ga.	25–26	.....	.....	0.11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.09	.....	.....	.....
Memphis, Tenn.	5–6	.....	.....	0.24	.....	.....	.....	.....	0.18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Meridian, Miss.	6	.....	.....	0.09	.....	.....	.....	.....	0.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Milwaukee, Wis.	10	.....	.....	0.82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.47	.....	.....	.....
Minneapolis, Minn.	9	.....	.....	1.82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.45	.....	.....	.....
Montgomery, Ala.	6	.....	.....	T.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nantucket, Mass.	21	.....	.....	0.36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.11	.....	.....	.....
Nashville, Tenn.	11	.....	.....	0.17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
New Haven, Conn.	21	.....	.....	0.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.53	.....	.....	.....
New Orleans, La.	6	.....	.....	0.47	.....	.....	.....	.....	.....	0.44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New York, N. Y.	12	.....	.....	1.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.66	.....	.....	.....
Norfolk, Va.	21	12:50 a. m.	6:20 a. m.	2.07	5:14 a. m.	5:55 a. m.	0.75	0.14	0.16	0.31	0.43	0.68	0.97	1.15	1.25	.....	.....	.....	.....	.....	.....
Northfield, Vt.	21	.....	.....	1.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.31	.....	.....	.....
North Head, Wash.	10	.....	.....	0.54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Oklahoma, Okla.	10	.....	.....	0.02	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Omaha, Nebr.	9	.....	.....	0.53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.36	.....	.....	.....
Palestine, Tex.	24–26	.....	.....	0.58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.11	.....	.....	.....
Parkersburg, W. Va.	5	.....	.....	0.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....
Pensacola, Fla.	6	.....	.....	0.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.05	.....	.....	.....
Philadelphia, Pa.	20–21	11:05 p. m.	10:48 a. m.	2.21	6:26 a. m.	8:15 a. m.	0.80	0.06	0.11	0.17	0.21	0.28	0.35	0.43	0.49	0.57	0.63	0.73	0.96	1.14	1.30
Pittsburg, Pa.	10–11	.....	.....	1.03	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.75	.....	.....	.....
Pocatello, Idaho.	9	.....	.....	0.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Portland, Me.	22	.....	.....	0.22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Portland, Oreg.	10–11	.....	.....	1.64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.33	.....	.....	.....
Pueblo, Colo.	8	.....	.....	0.11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.07	.....	.....	.....
Raleigh, N. C.	20–21	6:30 p. m.	D. N.	2.24	11:25 p. m.	12:15 a. m.	0.92	0.07	0.18	0.28	0.39	0.46	0.50	0.61	0.68	0.71	0.81	.....	.....	.....	.....
Richmond, Va.	20–21	11:00 p. m.	7:15 a. m.	2.45	1:15 a. m.	3:10 a. m.	0.67	0.05	0.11	0.17	0.22	0.30	0.42	0.54	0.66	0.74	0.79	0.89	1.08	1.27	1.47
Rochester, N. Y.	10	9:45 p. m.	10:35 p. m.	0.50	9:51 p. m.	10:14 p. m.	T.	0.06	0.22	0.38	0.45	0.49	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sacramento, Cal.	7–8	.....	.....	0.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.20	.....	.....	.....

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
St. Louis, Mo	10			0.16														0.14			
St. Paul, Minn	7–8			1.67														0.42			
Salt Lake City, Utah	12			0.28														0.19			
San Antonio, Tex	19	1:40 a. m.	4:40 a. m.	1.24	1:44 a. m.	2:13 a. m.	T.	0.25	0.30	0.50	0.75	1.00	1.08	1.12	1.16						
San Diego, Cal	5			0.07											0.07						
Sandusky, Ohio	5			0.18														0.18			
San Francisco, Cal	11			0.72														0.30			
Savannah, Ga	3			0.09														0.06			
Scranton, Pa	21			1.84														0.65			
Seattle, Wash	11			0.86														0.56			
Shreveport, La	9			0.11				0.10													
Spokane, Wash	8			0.25														0.16			
Springfield, Ill	10			0.08							0.06										
Springfield, Mo	4			0.20					0.20												
Syracuse, N. Y	21			1.07														0.24			
Tampa, Fla	18–19			2.53														0.51			
Taylor, Tex	24–26			3.66														0.30			
Toledo, Ohio	10			0.25						0.16											
Topeka, Kans	10			0.09														0.05			
Valentine, Nebr	18			0.43														0.08			
Vicksburg, Miss	11			0.06					0.06												
Washington, D. C	21			2.02														0.71			
Wichita, Kans	4			0.22						0.17											
Williston, N. Dak	13			0.11														0.10			
Wilmington, N. C	20–21			0.84														0.29			
Wytheville, Va	22			0.01																	
Yankton, S. Dak	17–19			2.50														0.28			
Havana, Cuba	18			0.67														0.44			
San Juan, Porto Rico	8	3:15 p. m.	7:40 p. m.	1.51	4:19 p. m.	4:50 p. m.	0.59	0.18	0.40	0.51	0.54	0.59	0.67								
Honolulu, H. I	31			0.13														0.13			

*Self-register not working

TABLE VI.—*Data furnished by the Canadian Meteorological Service, October, 1904.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.80	29.94	+.03	45.2	— 0.2	51.8	38.6	8.41	+3.06	
Sydney, C. B. I	29.97	30.01	+.05	47.0	+ 0.5	54.9	39.1	3.01	—1.68	
Halifax, N. S	29.93	30.04	+.04	46.5	— 0.7	55.3	37.6	5.03	—0.52	
Grand Manan, N. B	29.98	30.03	+.03	46.7	— 0.2	53.0	40.4	3.68	—1.03	
Yarmouth, N. S	29.97	30.04	+.02	46.2	— 1.4	53.0	39.4	4.07	—0.63	
Charlottetown, P. E. I	29.95	29.99	+.03	45.1	— 1.4	52.3	37.9	4.11	—0.79	
Chatham, N. B	29.93	29.95	—.01	44.4	+ 1.4	54.2	34.5	3.46	—0.40	T.
Father Point, Que	29.92	29.94	—.01	39.8	0.0	46.1	33.5	3.21	+0.31	
Quebec, Que	29.68	30.01	+.01	41.3	— 1.1	47.9	34.7	3.45	+0.39	0.2
Montreal, Que	29.83	30.04	+.05	43.6	— 1.2	50.1	37.1	3.21	+0.08	T.
Rockliffe	29.43	29.98	—.05	41.9	— 0.9	51.1	32.7	2.68	+0.25	1.0
Ottawa, Ont	29.69	30.02	+.01	44.2	+ 0.4	51.7	36.7	1.40	—1.15	T.
Kingston, Ont	29.75	30.06	+.03	46.1	— 0.9	54.2	38.1	2.46	—0.27	0.3
Toronto, Ont	29.69	30.07	—.03	46.0	— 0.6	54.2	37.8	2.48	+0.12	0.6
White River, Ont	28.69	30.06	+.05	36.0	— 1.1	42.9	29.2	3.78	+1.43	10.2
Port Stanley, Ont	29.43	30.07	+.02	46.3	— 1.5	54.8	37.9	1.71	—1.27	1.0
Saugeen, Ont	29.34	30.05	+.03	46.5	+ 0.4	54.5	38.5	2.01	—1.16	1.6
Parry Sound, Ont	29.29	30.04	+.03	43.9	0.0	52.1	35.7	1.34	—2.58	T.
Port Arthur, Ont	29.32	30.03	+.05	41.0	+ 1.1	47.3	34.6	3.62	+1.06	
Winnipeg, Man	29.17	30.02	+.04	43.6	+ 4.5	51.8	35.3	1.51	—0.19	4.4
Minnedosa, Man	28.19	30.04	+.07	42.4	+ 4.6	51.7	33.0	0.73	—0.47	0.3
Qu'Appelle, Assin	27.71	29.96	—.01	44.5	+ 5.1	54.9	34.1	0.36	—0.74	0.8
Medicine Hat, Assin	27.68	29.97	.00	48.9	+ 4.1	62.8	35.1	0.52	—0.06	T.
Swift Current, Assin	27.42	30.00	+.03	45.9	+ 3.8	57.6	34.2	0.41	—0.47	0.3
Calgary, Alberta	26.42	29.97	+.02	43.7	+ 3.6	56.4	31.0	1.35	+0.87	13.3
Banff, Alberta	25.40	30.01	+.06	42.9	+ 3.6	53.6	32.2	0.57	—0.45	3.6
Edmonton, Alberta	27.63	29.93	.00	44.5	+ 3.4	55.7	33.3	1.13	+0.43	1.0
Prince Albert, Sask	28.36	29.93	—.04	40.8	+ 3.7	50.4	31.1	0.72	—0.11	
Battleford, Sask	28.24	29.99	+.02	43.6	+ 4.0	54.7	32.4	1.07	—0.62	T.
Kamloops, B. C										
Victoria, B. C	29.92	30.02	+.01	52.7	+ 3.5	57.5	47.9	0.88	—1.49	
Barkerville, B. C	25.65	29.97	+.03	39.3	— 0.4	46.3	32.3	3.40	+0.70	1.0
Hamilton, Bermuda	29.83	29.99	—.03	73.4	+ 0.4	78.1	68.8	8.10	+1.39	
Dawson, Yukon										

TABLE VII.—*Heights of rivers referred to zeros of gages, October, 1904.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Milk River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Havre, Mont	237	9	3.0	8	2.4	5,6	2.7	0.6
Yellowstone River.								
Glendive, Mont. (1)	78	17	2.0	19	1.2	5–16	1.4	0.8
James River.								
Lamoure, N. Dak	330	14	— 0.3	1	— 1.2	30, 31	—0.7	0.9
Huron, S. Dak	139	9	0.9	18	0.5	1–6, 8, 24	0.6	0.4
Republican River.								
Clay Center, Kans	42	18	7.1	24, 25	6.0	1, 2	6.5	1.1
Kansas River.								
Manhattan, Kans	160	18	5.2	4	2.8	19	3.5	2.4
Topeka, Kans	87	21	7.6	1	6.1	19–21	6.6	1.5
Missouri River.								
Townsend, Mont	2,504	11	4.0	24–31	3.8	1–9	3.9	0.2
Fort Benton, Mont	2,285	12	0.8	27–31	0.3	1	0.5	0.5
Bismarck, N. Dak	1,309	14	0.2	28–31	— 0.5	6–10, 13	—0.3	0.7
Pierre, S. Dak	1,114	14	2.4	2	1.5	28	1.8	0.9
Sioux City, Iowa	784	19	5.7	21	4.6	17–19	5.0	1.1
Blair, Nebr	705	15	5.1	23, 24	4.2	17, 18	4.5	0.9
Omaha, Nebr	669	10						
Missouri River—Cont'd.								
St. Joseph, Mo	481	10	2.2	24	0.4	10–12	1.0	1.8
Kansas City, Mo	388	21	8.3	26	6.2	21	7.0	2.1
Glasgow, Mo	231	19	4.2	5	2.0	20–23	2.9	2.2
Boonville, Mo	199	20	8.2	6	5.7	25	6.6	2.5
Hermann, Mo	103	24	8.0	2	5.5	23–25	6.3	2.5
Minnesota River.								
Mankato, Minn	127	18	2.8	23	1.9	1–9	2.3	0.9
St. Croix River.								
Stillwater, Minn. (2)	23	11	10.7	24	5.0	10	9.1	5.7
Chippewa River.								
Chippewa Falls, Wis	75	16						
Red Cedar River.								
Cedar Rapids, Iowa	77	14	3.0	13–31	2.7	4,8	2.9	0.3
Iowa River.								
Iowa City, Iowa	57		— 1.0	10	— 1.6	25	—1.3	0.6
Illinois River.								
Peoria, Ill	135	14	9.7	2,3	8.1	30,31	8.8	1.6
Red Bank Creek.								
Brookville, Pa	35	8	0.4	1–31	0.4	1–31	0.4	0.0

TABLE VII.—*Heights of rivers referred to zeros of gages.*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Clarion River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Clarion, Pa.	32	10	2.7	23	0.3	21	1.2	2.4
Conemaugh River.								
Johnstown, Pa.	64	7	0.8	12–14	0.4	1, 2, 5	0.6	0.4
Allegheny River.								
Warren, Pa.	177	14	2.8	25	0.3	10, 11	1.3	2.5
Oil City, Pa	123	13	2.8	25	1.1	10, 11	1.7	1.7
Parker, Pa.	73	20	2.8	25, 26	0.9	11	1.5	1.9
Freeport, Pa	29	20	4.8	26, 27	1.7	11, 12	2.7	3.1
Cheat River.								
Rowlesburg, W. Va	36	14	1.2	14	0.2	5, 11	0.6	1.0
Youghiogheny River.								
Confluence, Pa.	59	10	— 0.6	25–31	— 0.8	4–23	—0.7	0.2
West Newton, Pa	15	23	0.0	1–31	0.0	1–31	0.0	0.0
Monongahela River.								
Weston, W. Va.	161	18	— 2.2	1	— 2.4	2–31	—2.4	0.2
Fairmont, W. Va.	119	25	13.7	1, 2	12.4	31	12.9	1.3
Greensboro, Pa	81	18	6.3	15	5.4	20, 21	5.8	0.9
Lock No. 4, Pa.	40	28	6.9	21	5.2	10–16	5.8	1.7
Beaver River.								
Ellwood Junction, Pa.	10	14	1.3	3, 11	0.9	1, 2	1.1	0.4
Muskingum River.								
Zanesville, Ohio	70	20	8.1	11	7.4	{1–5, 23, / 30, 31}	7.6	0.7
Little Kanawha River.								
Glenville, W. Va	77	20	0.0	24	— 1.2	4, 16, 21,	—0.9	1.2
Creston, W. Va.	38	20	— 0.8	1–31	— 0.8	1–31	—0.8	0.0
Great Kanawha, River.								
Charleston, W. Va.	58	30	6.8	18–31	6.0	13–16	6.4	0.8
New River.								
Radford, Va	155	14	— 1.4	1, 2, 5, 6	— 1.9	26–31	—1.7	0.5
Hinton, W. Va.	95	14	0.9	1–4	0.8	5–31	0.8	0.1
Scioto River.								
Columbus, Ohio	110	17	2.6	14	2.0	1–11, 17–31	2.1	0.6
Licking River.								
Falmouth, Ky	30	25	0.2	1–8, 12–15	0.0	18–31	0.1	0.2
Miami River.								
Dayton, Ohio	77	18	0.6	{1–3, 7–9, / 23–25, / 29–31}	0.1	16	0.5	0.5
Kentucky River.								
Jackson, Ky.	287	24	1.1	1, 12	0.6	21-23, 30, 31	0.8	0.5
Beattyville, Ky	254	30	0.2	1–10	— 1.7	27–31	—0.8	1.9
High Bridge, Ky.	117	17	9.6	14	8.2	12	8.6	1.4
Frankfort, Ky.	65	31	5.9	17	3.5	10–14	4.8	2.4
Wabash River.								
Mount Carmel, Ill.	50	15	4.1	1	0.8	26–31	1.5	3.3
Cumberland River.								
Burnside, Ky.	518	50	0.3	1, 2	— 0.2	31	0.1	0.5
Celina, Tenn.	383	45	0.5	3, 12, 13	0.0	17–31	0.2	0.5
Carthage, Tenn.	308	40	0.4	2	— 0.3	1	0.0	0.7
Nashville, Tenn.	193	40	6.6	18–31	1.0	1, 5–8	4.3	5.6
Clarksville, Tenn.	126	42	2.8	28–31	1.4	11	1.9	1.4
Powell River.								
Tazewell, Tenn.	30	20	0.1	1–7	0.0	8–31	0.0	0.1
Clinch River.								
Speers Ferry, Va.	156	20	— 1.0	{2, 12, 21, / 24, 28, 31}	— 1.3	7–9	—1.1	0.3
Clinton, Tenn.	52	25	2.8	1	2.2	23–25, 31	2.4	0.6
Holston River.								
Bluff City, Tenn.	170	15	0.1	1–8	— 0.1	{16–19, / 21–27, / 29, 31}	0.0	0.2
Rogersville, Tenn.	103	14	1.2	1–7	1.0	23–31	1.1	0.2
French Broad River.								
Asheville, N. C.	144	6	— 0.7	1	— 1.9	29–31	—1.2	1.2
Leadvale, Tenn.	70	15	— 0.2	21	— 2.2	19	—1.8	2.0
Hiwassee River.								
Charleston, Tenn	18	22	0.1	1, 2	— 0.3	19	—0.1	0.4
Tennessee River.								
Knoxville, Tenn.	635	29	— 0.1	1, 2	— 0.4	25–27	—0.3	0.3
Loudon, Tenn	590	25	— 0.2	29–31	— 1.0	23–28	—0.7	0.8
Kingston, Tenn	556	25	0.7	6–8	0.3	17–31	3.8	0.4
Chattanooga, Tenn.	452	33	0.7	1, 2	0.1	21–31	0.3	0.6
Bridgeport, Ala.	402	24	0.1	3	— 0.4	25–31	—0.2	0.5
Florence, Ala.	255	16	— 0.2	1, 2	— 0.9	28–31	—0.6	0.7
Riverton, Ala.	225	25	— 2.1	8	— 3.1	24, 25, 28–31	—2.7	1.0
Johnsonville, Tenn.	95	21	— 0.1	1, 2	— 0.9	26–21	—0.6	0.8
Ohio River.								
Pittsburg, Pa.	966	22	6.8	17	5.8	10, 20	6.3	1.0
Davis Island Dam, Pa.	960	25	4.5	26	2.6	25	3.2	1.9
Beaver Dam, Pa	925	27	5.4	27	2.9	11	3.6	2.5
Wheeling, W. Va.	875	36	4.9	28	2.6	14-16, 23, 26	3.2	2.3
Parkersburg, W. Va.	785	36	5.2	30	1.8	1	3.3	3.4
Point Pleasant, W. Va.	703	39	2.8	31	0.7	2, 3	1.6	2.1
Huntington, W. Va.	660	50	5.2	31	2.8	3	3.9	2.4
Catlettsburg, Ky.	651	50	2.9	31	1.1	1–4	1.6	1.8
Portsmouth, Ohio	612	50	3.6	23	1.9	2–4	2.8	1.7
Maysville, W. Va.	559	50	3.4	24	2.2	4, 5	2.8	1.2
Cincinnati, Ohio.	499	50	4.9	25, 26	3.3	6, 7	3.8	1.6
Madison, Ind	413	46	3.6	28	2.5	9	3.1	1.1
Louisville, Ky.	367	28	2.8	27–30	2.0	8 10	2.5	0.8
Evansville, Ind	184	35	2.4	1	0.9	13, 14	1.5	1.5
Mount Vernon, Ind.(5)	148	35	1.3	18–20	0.7	15	1.1	0.6
Paducah, Ky.	47	40	2.8	2	0.2	29–31	1.0	2.6
Cairo, Ill.	1	45	12.9	3	6.8	24, 25	8.8	6.1
St. Francis River.								
Marked Tree, Ark.	104	17	2.4	11–18	1.7	1–3	2.1	0.7
Neosho River.								
Neosho Rapids, Kans.	326	22	0.7	4	0.1	26–30	0.3	0.6
Iola, Kans.	262	10	0.4	5–7, 15, 16	0.2	22–31	0.3	0.2
Oswego, Kans.	184	20	0.6	1–10	0.2	27–31	0.4	0.4
Fort Gibson, Ind. T.	3	22	10.8	2	8.6	16–20	9.2	2.2
Canadian River.								
Calvin, Ind. T.	99	10	9.0	4	— 0.9	24	0.3	9.9
Black River.								
Blackrock, Ark.	67	12	2.0	6	0.4	4	1.3	1.6

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
White River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Calicorock, Ark	272	15	— 0.1	6	— 0.6	21–31	—0.4	0.5
Batesville, Ark.	217	18	2.7	7	2.2	26–31	2.4	0.5
Newport, Ark.	185	26	1.3	6	0.3	29–31	0.7	1.0
Arkansas River.								
Wichita, Kans.	832	10	4.1	5	— 0.2	1	1.6	4.3
Tulsa, Ind. T.	551	16	3.5	11, 12	2.0	6, 7	2.5	1.5
Webbers Falls, Ind. T.	465	23	6.6	5	3.8	{4, 7–10, / 30, 31}	4.2	2.8
Fort Smith, Ark.	403	22	14.0	6	3.1	31	4.9	10.9
Dardanelle, Ark	256	21	13.4	7	3.0	31	4.5	10.4
Little Rock, Ark.	176	23	12.8	8	4.5	29, 30	6.2	8.3
Yazoo River.								
Yazoo City, Miss.	80	25	— 2.5	8	— 2.8	1, 13–31	2.7	0.3
Ouachita River.								
Camden, Ark.	304	39	4.6	14	3.2	26–31	3.8	1.4
Monroe, La	122	40	2.0	6	0.3	31	1.0	1.7
Red River.								
Arthur City, Tex.	688	27	6.6	27–31	5.8	1–6, 14–25	6.0	0.8
Fulton, Ark.	515	28	10.3	4	5.5	30, 31	6.9	4.8
Shreveport, La.	327	29	3.5	8	—0.6	31	0.8	4.1
Alexandria, La.	118	33	2.2	13	—0.5	31	0.5	2.7
Mississippi River.								
St. Cloud, Minn	2,034	4	2.3	14, 20, 21	0.8	3, 4, 7	1.7	1.5
St. Paul, Minn.	1,954	14	7.8	27, 28	3.2	1	5.8	4.6
Red Wing, Minn.	1,914	14	7.7	16, 26, 27	3.1	8	5.8	4.6
Reeds Landing, Minn	1,884	12	7.4	15	3.0	7	5.6	4.4
La Crosse, Wis.	1,819	12	8.8	18, 19	4.0	6–9	6.6	4.8
Prairie du Chien, Wis.	1,759	18	10.5	22, 23	3.8	1	7.0	6.7
Dubuque, Iowa.	1,699	18	10.8	24	4.1	1	7.2	6.7
Clinton, Iowa	1,629	16	9.6	26, 27	3.8	1–3	6.4	5.8
Leclaire, Iowa.	1,609	10	6.5	26, 27	2.3	1–3	4.2	4.2
Davenport, Iowa.	1,593	15	8.6	27	3.8	1, 3, 4	5.7	4.8
Muscatine, Iowa	1,562	16	9.4	27, 28	4.5	3	6.5	4.9
Galland, Iowa.	1,472	8	4.4	29, 30	2.0	5–8	2.8	2.4
Keokuk, Iowa	1,463	15	7.3	29, 30	3.2	5–7	4.6	4.1
Warsaw, Ill.	1,458	18	10.0	29, 30	5.9	8, 9	7.4	4.1
Hannibal, Mo.	1,402	13	8.2	30, 31	4.2	7, 8	5.5	4.0
Grafton, Ill.	1,306	23	10.5	1	7.3	15–21	8.0	3.2
St. Louis, Mo.	1,264	30	11.7	1	6.6	19–21	8.2	5.1
Chester, Ill	1,189	30	10.7	1, 2	6.6	20–23	7.9	4.1
New Madrid, Mo.	1,003	34	10.2	4	5.5	24–26	7.2	4.7
Luxora, Ark.	905	33	4.7	5	0.8	24–27	2.3	3.9
Memphis, Tenn	843	33	7.2	6	3.0	23–28	4.6	4.2
Helena, Ark.	767	42	10.6	7	5.3	27–29	7.6	5.3
Arkansas City, Ark.	635	42	12.5	12	5.7	29–31	8.9	6.8
Greenville, Miss.	595	42	9.9	12	4.7	30, 31	7.2	5.2
Vicksburg, Miss.	474	45	9.1	13	3.0	31	6.5	6.1
Baton Rouge, La	240	35	6.4	15, 16	3.1	30	5.0	3.3
Donaldsonville, La	188	28	5.0	15–17	2.6	29	4.0	2.4
New Orleans, La.	108	16	5.3	16, 17	3.3	28	4.4	2.0
Atchafalaya River.								
Melville, La.	103	31	10.2	16	4.8	31	8.1	5.4
Mohawk River.								
Tribeshill, N. Y.	42	15	9.5	22	— 1.9	9	0.0	11.4
Schenectady, N. Y.	19	15	9.0	22	1.8	6–11	2.8	7.2
Hudson River.								
Glens Falls, N. Y.	197	.....	11.4	23	5.6	21	7.6	5.8
Troy, N. Y.	154	14	12.0	23	3.3	19	5.8	8.7
Albany, N. Y.	147	12	9.5	22	2.0	19	4.1	7.5
Pompton River.								
Pompton Plains, N. J.	6	8	5.7	22	4.1	1–12, 14–21	4.3	1.6
Passaic River.								
Chatham, N. J.	69	7	4.6	22	2.3	7–11	2.9	2.3
Lehigh River.								
Mauchchunk, Pa.	45	15	7.1	2	3.9	11	4.5	3.2
Schuylkill River.								
Reading, Pa.	66	12	2.5	22	0.0	3–11, 20	0.4	2.5
Delaware River.								
Hancock (E. Branch), N. Y.	269	12	10.3	22	3.2	8–12	4.1	7.1
Hancock (W. Branch), N. Y.	269	10	7.9	22	3.3	8	4.2	4.6
Port Jervis, N. Y (3)	204	14	8.7	22	0.7	13	2.3	8.0
Phillipsburg, N. J.	142	26	11.1	22	1.3	9–12	2.7	9.8
Trenton, N. J.	92	18	7.1	23	1.1	11	2.2	6.0
North Branch Susquehanna.								
Binghamton, N. Y.	183	16	7.3	22, 23	2.5	9–11	3.7	4.8
Towanda, Pa.	139	16	5.8	23	1.0	11, 12	2.5	4.8
Wilkesbarre, Pa.	60	17	10.2	23, 24	3.8	11	5.9	6.4
West Branch Susquehanna.								
Lockhaven, Pa.	65	12	— 2.0	1–31	— 2.0	1–31	—2.0	0.0
Williamsport, Pa.	39	20	1.7	23	0.5	12	1.1	1.2
Juniata River.								
Huntingdon, Pa.	90	24	3.2	22	2.9	{1–6, 8, 12, / 26–31}	3.0	0.3
Susquehanna River.								
Harrisburg, Pa.	69	17	5.0	25	2.1	11–13	2.9	2.9
Shenandoah River.								
Riverton, Va.	58	22	0.5	1–31	0.5	1–31	0.5	0.0
Potomac River.								
Cumberland, Md.	290	8	1.0	10, 31	0.0	1, 2	0.9	1.0
Harpers Ferry, W. Va.	172	18	— 0.9	2, 3	— 2.4	18–20	—1.8	1.5
James River.								
Buchanan, Va.	305	12	1.8	1, 24–29	1.6	3, 4	1.7	0.2
Lynchburg, Va.	260	18	0.2	21–24	— 0.5	10–20	—0.2	0.7
Columbia, Va.	167	18	2.1	1, 22, 23	1.6	12	1.9	0.5
Richmond, Va.	111	12	0.8	31	— 1.4	7	—0.6	2.2
Dan River.								
Danville, Va.	55	8	— 0.3	1–6	— 0.6	20, 31	—0.4	0.3
Roanoke River.								
Clarksville, Va (4).	196	12	1.5	4, 5, 11, 12	0.5	3	0.4	1.0
Weldon, N. C.	129	30	9.8	21	7.9	13, 14	8.3	1.9
Cape Fear River.								
Fayetteville, N. C.	112	38	11.0	22	2.0	19, 20	3.9	9.0
Waccamaw River.								
Conway, S. C.	40	7	6.0	1	2.0	24	3.5	4.0

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Pedee River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Cheraw, S. C	149	27	2.5	27	1.3	12, 13	1.7	1.2
Smiths Mills, S. C	51	16	4.6	1	0.4	21	2.3	4.2
Lynch Creek.								
Effingham, S. C	35	12	4.0	1–3	2.4	30, 31	3.1	1.6
Black River.								
Kingstree, S. C	45	12	2.8	4	0.0	18–20, 28	1.3	2.8
Catawba River.								
Mount Holly, N. C	28	15	1.5	1–4, 7, 8	1.2	25, 26	1.4	0.3
Wateree River.								
Camden, S. C	37	24	4.5	27	3.0	1, 2, 4, 18, 25	3.5	1.5
Congaree River.								
Columbia, S. C	52	15	− 0.3	27–31	− 3.0	4–11	−2.0	2.7
Santee River.								
St. Stephens, S. C	50	12	− 1.2	1–3, 31	− 2.2	26	−1.7	1.0
Edisto River.								
Edisto, S. C	75	6	1.5	30	0.8	19–24	1.0	0.7
Broad River.								
Carlton, Ga	80	11	1.7	27, 28	1.5	1–25	1.5	0.2
Savannah River.								
Calhoun Falls, S. C	347	15	1.8	1	1.0	13–18	1.2	0.8
Augusta, Ga	268	32	5.0	1, 31	3.7	29	4.2	1.3
Oconee River.								
Milledgeville, Ga	147	25	0.9	4	0.2	16, 18, 19	0.5	0.7
Dublin, Ga	79	30	− 1.1	31	− 1.5	18, 20–26	−1.4	0.4
Ocmulgee River.								
Macon, Ga	203	18	0.2	7	− 1.0	5	−0.2	1.2
Abbeville, Ga	96	11	0.6	1	− 0.3	23–25	−0.4	0.9
Flint River.								
Woodbury, Ga	227	10	− 0.2	1	− 0.5	24	−0.4	0.3
Albany, Ga	90	20	0.0	1–3	− 0.4	26–28	−0.2	0.4
Bainbridge, Ga (6)	29	22	1.9	8	1.4	22–31	1.6	0.5
Chattahoochee River.								
West Point, Ga	239	20	1.2	{1–4, 7, 8, 21, 28}	0.9	23–26	1.1	0.3
Eufaula, Ala	90	40	0.0	1	− 0.6	15–17	0.4	0.6
Alaga, Ala (7)	30	25	0.6	20	− 0.3	18, 19, 26	0.0	0.9
Coosa River.								
Rome, Ga	271	30	− 0.3	1, 2	− 0.9	26–31	−0.7	0.6
Gadsden, Ala	144	22	− 1.0	1–5, 7–10	− 1.2	29–31	−1.1	0.2
Lock No. 4, Ala	116	17	− 0.7	1–13	− 1.0	27–31	−0.8	0.3
Wetumpka, Ala	6	45	0.1	1	− 0.5	29, 31	−0.2	0.6
Tallapoosa River.								
Milstead, Ala	38	35	1.2	10	0.1	12, 24	0.5	1.1
Alabama River.								
Montgomery, Ala	265	35	− 1.3	1	− 1.9	23–25, 27–31	−1.8	0.6
Selma, Ala	212	35	− 1.3	1	− 1.8	9–31	−1.7	0.5
Black Warrior River.								
Tuscaloosa, Ala	90	43	4.4	1, 5, 6	4.0	30, 31	4.2	0.4
Tombigbee River.								
Columbus, Miss	308	33	− 2.8	1, 2	− 3.1	29–31	−2.9	0.3
Demopolis, Ala	155	35	− 3.3	2–4, 10	− 3.8	28–31	−3.6	0.5
Leaf River.								
Hattiesburg, Miss (5)	60	20	2.3	15–31	2.3	15–31	2.3	0.0
Chickasawhay River.								
Enterprise, Ala (5)	144	18	0.0	15–31	0.0	15–31	0.0	0.0
Pearl River.								
Jackson, Miss (5)	242	20	0.6	15	0.3	26–31	0.4	0.3
Sabine River.								
Logansport, La	195	25	1.2	1, 2	0.1	30, 31	0.7	1.1
Neches River.								
Rockland, Tex	105	20	− 0.1	1, 2	− 0.8	20, 27–31	−0.5	0.7
Beaumont, Tex	18	10	2.2	18	0.2	22	1.3	2.0
Trinity River.								
Dallas, Tex	320	25	12.8	28	2.1	16, 17	3.4	10.7
Riverside, Tex	112	40	1.6	1	− 0.7	22–31	−0.2	2.3
Liberty, Tex	20	25	5.4	18	3.4	23	4.4	2.0
Brazos River.								
Kopperl, Tex	345	21	9.0	26	0.4	18	2.8	8.6
Waco, Tex	285	24	9.6	27	2.7	17, 18	4.4	6.9
Hempstead, Tex	140	40	13.0	29	2.1	20–22	0.9	10.9
Booth, Tex	61	39	4.0	19	2.2	26, 27, 31	2.8	1.8
Colorado River.								
Ballinger, Tex	489	21	5.0	16	1.3	10–14	2.0	3.7
Austin, Tex	214	18	6.5	28	1.0	16, 17	2.1	5.5
Columbus, Tex	98	24	15.2	29	5.9	24	8.0	9.3
Guadalupe River.								
Gonzales, Tex (8)	112	22	5.3	26	0.5	{18, 19, 21, 23, 24}	1.2	4.8
Red River of the North.								
Moorhead, Minn.	284	26	8.3	{12, 17–19, 25, 26}	8.0	1, 2	8.2	0.3
Kootenai River.								
Bonners Ferry, Idaho	123	24	1.6	1	0.0	28–31	0.6	1.6
Pend d'Oreille River.								
Newport, Wash	86	14	− 0.8	1–7	− 1.4	28–31	−1.1	0.6
Snake River.								
Lewiston, Idaho	144	24	2.2	17, 18	1.5	5	2.0	0.7
Riparia, Wash	67	30	2.4	13–31	2.0	1–4	2.3	0.4
Columbia River.								
Wenatchee, Wash	473	40	6.8	1, 2	5.5	31	6.3	1.3
Umatilla, Oreg	270	25	2.1	1	− 0.1	30, 31	0.8	2.2
The Dalles, Oreg	166	40	3.9	1, 2	1.6	31	2.7	2.3
Willamette River.								
Albany, Oreg	118	20	2.2	18	0.9	1–10, 29–31	1.2	1.3
Salem, Oreg	84	20	1.3	18	0.2	4–10	0.5	1.1
Portland, Oreg	12	15	4.3	16	0.7	18	2.2	3.6
Sacramento River.								
Red Bluff, Cal	201	23	17.4	11	0.4	1, 2	4.2	17.0
Sacramento, Cal	64	25	18.0	12	9.2	6–8	11.7	8.8

(1) 23 days only. (2) 22 days only. (3) 19 days only. (4) 12 days only. (5) 17 days only. (6) 24 days only. (7) 14 days only. (8) 15 days only.

HAWAIIAN CLIMATOLOGICAL DATA.

By ALEXANDER McC. ASHLEY, Section Director, United States Weather Bureau.

GENERAL SUMMARY FOR OCTOBER, 1904.

Following is the summary of meteorological conditions in the Hawaiian Islands during October, 1904:

Approximate percentages of district rainfall as compared with normals: Hawaii, Hilo, 28 per cent; Hamakua, 22 per cent; Kohala, 42.5 per cent; Kona, 105.5 per cent; Kau, 81.7 per cent; Maui, Paia, 100 per cent; Wailuku, 106 per cent; Kauai, 97.2 per cent; Oahu, Honolulu district, 74.2 per cent; Koolau, 52 per cent.

The greatest monthly rainfall reported was 14.65 inches at Nahiku, Maui. The greatest 24-hour rainfall was 3.63 inches at Nahiku, Maui, on the 26th.

United States Weather Bureau, dew-point, 66°; relative humidity, 69 per cent. United States Magnetic Station, dew-point, 67°; relative humidity, 71 per cent.

Hawaii.—Kohala reports earthquake shocks on the 14th and 23d. Puueo reports earthquake shock on the 14th.

Oahu.—United States Weather Bureau, United States Experiment Station, Punahou, Waiawa, and Ahuimanu report earthquake shocks on the 14th. United States Magnetic Station reports lunar rainbow on the 25th.

Temperature table for October, 1904.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.	Highest.	Lowest.
	Feet.	°	°	°	°	°
Olaa Mill	210	83.0	61.0	72.0	87	59
Volcano House	4,000	73.0	53.0	63.0	79	51
Kohala	521	80.0	66.0	73.0	82	66
Niulii	200	83	72	78	86	69
Ookala	400	.....	68	.....	.....	66
Pepeekeo	100	81.0	70.0	76.0	84	69
United States Weather Bureau	121	82.0	72.0	77.0	84	68
United States Magnetic Station	50	87.0	69.0	78.0	89	65
United States Experiment Station	350	85.0	72.0	78.0	89	69
Punahou	47	82.0	72.0	77.0	85	66
Kahuku	25	84.0	74.0	79.0	86	72
Kilauea	342	82.0	69.0	75.0	86	64
Lihue	200	85.0	69.0	77.0	88	61
Koloa	241	80.0	69.0	75.0	83	63
Wailuku	250	85.0	69.0	77.0	88	63
Kipahulu	308	82.0	70.0	76.0	84	67
Kailua (Huelo)	285	83.0	67.0	75.0	91	62
Nahiku	1,600	78.0	66.0	72.0	88	61
Waiakoa	900	79.0	61.0	70.0	83	57
Keomuku	10	81.0	67.0	74.0	86	62
Hilo	50	.....	.....	.....	.....	.....
Waimea	2,730	.....	.....	.....	.....	.....
Kinau Street (Castle)	50	.....	.....	.....	.....	.....
Ewa Mill	60	.....	.....	.....	.....	.....

Maui.—Kipahulu reports lightning on the 1st and 2d, and two slight earthquake shocks on the 14th.

Kahoolawe (northwest coast) reports a dust storm on the 29th.

Honolulu, Hawaii, latitude, 21° 19′ north, longitude 157° 52′ west; barometer above sea, 38 feet; gravity correction, —.057, applied. October, 1904.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	29.91	29.91	78.5	78.5	81	74	73.7	80	74.0	81	e.	3	e.	2	0.00	0.00	10	S.-cu.	calm.	7	S.-cu.	calm.
2	29.90	29.90	79.4	77.0	82	73	74.7	80	71.5	77	se.	8	ne.	2	0.00	0.00	2	Cu.	e.	3	S.-cu.	calm.
3	29.92	29.94	80.0	79.0	84	72	73.8	75	71.8	70	se.	5	e.	6	0.00	0.00	1	Ci.-s.	w.	2	S.-cu.	calm.
																	3	Cu.	se.			
4	29.96	29.96	80.5	76.0	83	73	70.0	59	72.8	86	e.	12	e.	4	0.00	T.	1	Cu.	e.	5	N.	e.
5	29.97	29.95	78.5	78.2	82	75	72.1	73	69.7	65	e.	13	ne.	10	0.01	T.	5	Cu.	e.	Few.	S.-cu.	calm.
																	3	N.	e.			
6	29.97	29.98	79.4	78.3	84	75	70.0	62	70.0	67	e.	13	e.	6	0.00	T.	2	Cu.	e.	2	S.-cu.	calm
7	30.02	30.03	78.5	78.0	84	75	70.0	66	68.3	61	ne.	11	ne.	10	0.00	0.00	4	Cu.	e.	2	S.-cu.	calm.
																	1	S.-cu.	e.			
8	30.05	30.03	78.8	78.0	83	75	68.0	57	69.0	63	e.	8	e.	7	0.00	T.	3	Ci.-s.	w.	10	N.	calm.
9	30.04	30.05	77.5	77.3	83	73	70.0	69	69.0	66	ne.	10	ne.	4	0.02	0.01	1	Cu.	e.	2	S.-cu.	e.
10	30.06	30.06	75.3	77.3	83	72	71.1	81	70.0	70	n.	4	ne.	6	0.11	0.03	9	Cu.	e.	3	S.-cu.	e.
																	6	Cu.	e.			
																	1	S.-cu.	e.			
11	30.05	30.00	78.5	75.5	82	74	71.0	69	70.0	76	ne.	3	se.	7	0.01	0.01	2	Cu.	ne.	9	N.	calm.
																	4	N.	ne.			
12	30.00	30.02	78.0	77.4	82	74	70.0	67	68.4	63	ne.	7	ne.	5	0.01	T.	3	Cu.	ne.	5	Cu.	e.
																	1	S.-cu.	ne.			
13	30.05	30.02	79.4	77.5	83	76	69.0	59	67.4	59	e.	15	e.	17	0.00	0.00	2	Cu.	ne.	1	Cu.	e.
14	30.08	30.06	78.5	73.5	81	72	70.0	66	70.1	84	ne.	10	ne.	12	0.05	0.05	2	Cu.	e.	6	N.	e.
15	30.07	30.05	78.0	77.3	84	72	71.0	71	68.2	63	e.	8	ne.	5	0.03	T.	6	N.	e.	1	S.-cu.	e.
16	30.04	30.02	79.1	77.2	82	73	68.8	59	68.4	64	ne.	11	ne.	10	0.00	0.00	1	Cu.	e.	2	Cu.	e.
17	30.00	30.01	78.5	77.3	82	73	69.8	64	70.3	71	e.	10	e.	4	T.	0.01	2	Cu.	e.	3	Cu.	ne.
18	29.99	29.97	79.0	75.4	83	69	71.8	70	69.9	76	n.	4	e.	2	0.06	T.	3	Cu.	ne.	8	S.-cu.	e.
19	29.97	29.94	77.4	75.0	81	69	70.1	70	69.0	74	ne.	2	ne.	4	0.03	T.	3	Ci.-s	calm.	2	A.-s.	calm.
																	1	Cu.	e.	1	Cu.	calm.
20	29.95	29.92	78.2	76.0	83	69	70.3	68	69.2	71	se.	2	ne.	5	0.00	0.00	1	Cu.	e.	1	Cu.	ne.
21	29.92	29.94	79.3	76.2	83	72	70.3	64	69.0	69	ne.	6	ne.	5	0.00	T.	2	Cu.	ne.	1	Cu.	ne.
22	29.94	29.94	77.5	76.5	84	73	68.0	62	68.5	66	e.	7	e.	7	0.00	0.00	2	Cu.	e.	2	Cu.	e.
23	29.94	29.93	76.3	75.0	83	70	69.3	70	70.0	78	nw.	2	n.	5	0.00	T.	few.	Cu.	e.	1	Cu.	ne.
																	few.	S.-cu.	e.	8	N.	ne.
24	29.96	29.98	78.5	76.2	83	69	71.3	70	69.2	70	n.	4	e.	4	T.	T.	4	S.-cu.	ne.	1	Cu.	e.
25	29.97	30.01	75.5	71.8	80	71	71.0	80	70.3	93	sw.	5	n.	7	0.07	0.03	9	N.	s.	10	N.	calm.
26	30.03	30.03	78.0	75.0	80	72	69.3	64	68.0	70	ne.	7	ne.	10	0.15	T.	3	Ci.-s.	w.	5	S.-cu.	e.
																	5	S.-cu.	e.	3	N.	e.
27	30.02	29.99	72.0	76.1	79	72	69.0	86	69.0	70	ne.	13	e.	5	0.01	0.02	10	N.	ne.	6	S.-cu.	e.
28	30.02	30.03	77.4	77.0	81	71	68.0	62	67.0	59	e.	10	e.	18	0.03	0.00	5	Cu.	e.	2	Cu.	e.
29	30.06	30.07	77.5	76.2	82	75	69.3	66	68.0	65	ne.	7	s.	7	T.	T.	6	Cu.	e.	1	S.-cu.	calm.
30	30.09	30.11	78.1	74.0	82	71	66.6	54	68.0	74	e.	12	e.	12	0.00	0.04	2	Cu.	e.	9	S.-cu.	e.
31	30.10	30.10	73.8	76.2	80	68	67.2	71	68.0	65	ne.	13	ne.	9	0.10	0.13	9	S.-cu.	e.	8	S.-cu.	e.
Mean	30.00	30.00	77.9	76.4	82	72	70.1	68	69.4	70	ne.	7.9	ne.	7.0	0.69	0.33	4.5	Cu.	e.	4.3	S.-cu.	e.

Observations are made at 8 a. m. and 8 p. m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. *Pressure values are reduced to sea level and standard gravity

Rainfall data for October, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Papaikou		5.20
Waiakea	50	3.95
Hilo (town)	100	
Kaumana	1,050	4.74
Pepeekeo	100	3.79
Hakalau	200	
Honohina	300	
Puuohua	1,050	4.84
Laupahoehoe	500	3.62
Ookala	400	1.45
Puueo	85	3.64
HAMAKUA, ne.		
Kukaiau	250	1.22
Paauilo	300	1.10
Paauhau	300	
Honokaa (Mill)	465	0.89
Honokaa (Meinicke)	1,100	1.12
Kukuihaele	700	1.83
Paauhau	1,150	
Paapau		
KOHALA, n.		
Awini Ranch	1,100	2.93
Niulii	200	1.33
Kohala (Mission)	521	0.99
Kohala (Sugar Co.)	270	1.36
Hawi Mill		
Puakea Ranch	600	1.64
Puuhue Ranch	1,845	1.45
Waimea	2,720	2.43
Halawa	450	
KONA, w.		
Huehue	2,000	5.21
Holualoa	1,350	7.88
HAWII—*Cont'd.*	*Feet.*	*Inches.*
Kaukahoku Leheula		
Kainaliu		
Kealakekua	1,580	9.02
Napoopoo	25	4.17
Hoopuloa	1,650	3.87
Hoopuloa	2,300	3.82
Puuwaawaa Ranch	2,736	0.55
Huehue		
KAU, se.		
Keaa Homesteads	2,000	
Kahuku Ranch		
Honuapo	15	1.82
Naalehu	650	3.47
Hilea	310	0.50
Pahala	850	1.15
Pahala (W. G. Ogg)		0.59
Volcano House	4,000	2.86
Kau Station	1,850	3.29
PUNA, e.		
Olaa, Mountain View (Russel)		
Olaa Plantation (Mill)	210	3.35
Olaa (20 miles)		
Kapoho	110	
Pahoa	600	
MAUI.		
Lahaina		
Waiopae Ranch	700	
Kaupo (Mokulau), s	285	4.27
Kipahulu, s	308	3.96
Hana		
Nahiku, ne	900	8.41
Nahiku	1,600	14.65
Haiku, n	700	4.98
Kula (Erehwon), n	4,000	
MAUI—*Cont'd.*	*Feet.*	*Inches.*
Kula (Waiakoa), n	2,700	0.49
Puuomalei, n	1,400	
Paia	180	2.28
Haleakala Ranch	2,000	
Wailuku, ne	250	1.18
Kailua	285	8.13
OAHU.		
U. S. Weather Bureau	108	1.02
Punahou (W. B.), sw	47	2.66
Kulaokahua (Castle), sw	50	0.99
Makiki Reservoir		
U. S. Naval Station, sw	6	0.85
Kapiolani Park, sw		
College Hill s.	175	3.56
Manoa (Woodlawn Dairy), e	285	8.01
Manoa (Rhodes Gardens)	360	10.91
Insane Asylum	30	2.36
School street (Bishop), sw		
Kamehameha School		
Kalihi-Uka, sw	485	8.01
Nuuanu (W. W. Hall), sw	50	2.25
Nuuanu (Wyllie street)	250	5.14
Nuuanu (Elec. Station), sw	405	4.77
Nuuanu (Luakaha), c	850	9.33
U. S. Experiment Station	350	3.51
Kalihla		
Laniakea (Nahuina)		
Tantalus Heights (Frear)	1,360	9.18
Waimanalo, ne	300	1.38
Maunawili, ne	300	2.45
Kaneohe	100	2.60
Ahuimanu, ne	350	3.80
Wahiawa	900	3.71
Ewa Plantation, s	60	
OAHU—*Cont'd.*	*Feet.*	*Inches.*
U. S. Magnetic Station	45	0.29
Waipahu	200	0.40
Moanalua	15	1.57
Kahuku, n	25	1.30
Waialua		
Pacific Heights		
KAUAI.		
Lihue (Kilohana)	200	3.50
Lihue (Grove Farm), e	200	3.14
Lihue (Molokoa), e	300	3.63
Lihue (Kukaua), e	1,000	3.47
Kealia, e		
Kilauea (Plantation), ne	342	5.48
Hanalei, n	10	
Waioli		
Haena		
Waiawa	32	0.89
Eleele	150	1.51
Wahiawa (Mountian)		
Wahiawa (New Mill)	250	2.80
McBryde (Residence)	850	5.48
Lawai (Gov. Road)	450	6.05
Lawai, w	225	3.82
Lawai, e	800	5.92
Koloa	241	5.13
Lawai Beach	5	4.67
Hanamaulu		3.39
Mahaulepu	90	4.68
Wilcox Ditch	725	8.90
LANAI.		
Keomuku (Gay)	10	1.21
Delayed September reports.		
Kulaokahua, Oahue (Castle)		1.84

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during October, 1904.*

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1904.	Normal, 1889–1903.	Observed, 1904.	Normal, 1889–1903.	Observed, 1904.	Normal, 1889–1903.	Observed, 1904.	Normal, 1889–1903.	Duration, 1904.
	Inches.	*Inches.*	° *F.*	° *F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.13	26.12	62.9	63.2	96	95	0.12	0.14	1.17
2 a. m	26.11	26.11	62.4	63.0	96	95	0.08	0.12	2.35
3 a. m	26.10	26.09	62.1	63.2	95	95	0.06	0.10	2.50
4 a. m	26.09	26.09	61.9	62.2	94	95	0.11	0.07	1.67
5 a. m	26.09	26.09	61.5	62.1	95	95	0.01	0.06	0.33
6 a. m	26.10	26.11	61.5	61.6	95	95	.....	0.06	.....
7 a. m	26.11	26.12	61.7	62.2	93	93	.....	0.07	.....
8 a. m	26.12	26.13	64.5	62.2	85	86	.....	0.07	.....
9 a. m	26.13	26.15	68.7	68.4	77	79	.....	0.05	.....
10 a. m	26.14	26.15	72.6	72.9	71	73	.....	0.05	.....
11 a. m	26.13	26.15	74.6	75.4	67	69	.....	0.05	.....
Noon	26.11	26.13	76.0	76.5	64	69	0.02	0.09	0.67
1 p. m	26.09	26.10	75.2	76.2	70	71	0.08	0.28	0.50
2 p. m	26.07	26.08	75.1	75.9	70	73	0.08	0.68	0.58
3 p. m	26.06	26.07	73.1	73.9	74	77	1.15	1.47	4.83
4 p. m	26.05	26.06	70.9	70.6	82	83	1.49	1.47	6.93
5 p. m	26.06	26.07	69.2	68.6	87	87	1.35	2.09	6.66
6 p. m	26.08	26.09	68.9	67.1	90	89	0.74	1.83	7.00
7 p. m	26.09	26.10	65.8	66.0	91	95	0.50	1.61	8.44
8 p. m	26.11	26.13	65.2	65.4	93	95	0.81	0.89	9.33
9 p. m	26.13	26.14	64.6	65.0	93	95	0.62	0.57	9.91
10 p. m	26.14	26.15	64.1	64.7	93	94	0.52	0.45	7.67
11 p. m	26.14	26.15	63.8	64.1	93	94	0.13	0.32	2.50
Midnight	26.14	26.14	63.2	63.5	93	94	0.10	0.20	4.00
Mean	26.11	26.11	67.0	67.2	86	87	.....	.....	.....
Minimum	26.02	25.97	57.2	56.1	44	.....	.....	.....	.....
Maximum	26.24	26.22	84.0	84.7	100	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	7.99	12.79	77.04

REMARKS.—At San José the barometer is 3,835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 14 feet above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, October, 1904.*

Time.	Sunshine.		Cloudiness.		Temperature of the soil at depth of—				
	Observed, 1904.	Normal, 1889–1903.	Observed, 1904.	Normal, 1889–1903.	6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
7 a. m	4.97	6.59	65	60	68.9	70.6	71.4	70.8	.....
8 a. m	18.63	18.51	.....	.....	.....	.....	.....	.....	.....
9 a. m	21.00	24.53	.....	.....	.....	.....	.....	.....	.....
10 a. m	20.51	21.45	67	65	71.5	70.4	71.4	72.0?	.....
11 a. m	19.01	19.17	.....	.....	.....	.....	.....	.....	.....
Noon	17.71	14.62	.....	.....	.....	.....	.....	.....	.....
1 p. m	12.39	11.72	89	83	71.1	70.8	71.4	70.7	.....
2 p. m	13.85	11.09	.....	.....	.....	.....	.....	.....	.....
3 p. m	11.42	8.39	.....	.....	.....	.....	.....	.....	.....
4 p. m	9.10	4.90	91	93	71.5	71.1	71.4	70.8	.....
5 p. m	3.50	1.87	.....	.....	.....	.....	.....	.....	.....
6 p. m	0.17	0.47	.....	.....	.....	.....	.....	.....	.....
7 p. m	.....	.....	89	92	71.2	71.2	71.5	70.8	.....
8 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m	.....	.....	73	79	71.2	70.9	71.5	70.8	.....
11 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	79	79	70.9	70.9	71.4	70.8	.....
Total	152.26	140.22	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Rainfall at stations in Costa Rica, October, 1904.*

Stations.	Height above sea level.	Observed, 1904.		Averages.		
		Amount.	Number of days.	Number of years.	Amount.	Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	.....	.....	4	7.76	19
Boca Banano	10	4.25	17	8	5.75	19
Bearesemt Farm	.....	1.42	18	.....	.....	.....
Port Limon	10	5.20	17	10	4.49	10
Coro Farm	.....	3.66	12	.....	.....	.....
Swamp Mouth	10	.....	.....	6	7.60	10
Zent	66	3.98	20	3	9.53	11
Victoria	.....	.....	.....	.....	.....	.....
Siquirres	197	.....	.....	6	7.68	10
Colombiana	.....	11.50	17	.....	.....	.....
Guapiles	984	10.59	24	.....	17.76	19
San Carlos	328	7.40	17	6	17.09	23
Las Lomas	873	.....	.....	4	12.64	19
Peralta	1,089	.....	.....	6	12.13	21
Turrialba	2,034	0.71	19	9	9.25	17
Juan Viñas	3,412	.....	.....	8	10.43	14
Santiago	3,609	.....	.....	3	8.31	19
Cachi	3,346	5.32	22	3	7.20	23
Paraiso	4,383	.....	.....	3	7.32	13
Cartago	4,761	.....	.....	.....	.....	.....
Tres Rios	4,265	7.72	20	15	15.39	22
San Francisco Guadalupe	3,894	10.43	23	8	12.48	24
San José	3,806	7.99	23	15	14.06	26
La Verbena	3,740	11.18	26	8	14.13	24
Nuestro Amo	2,593	9.53	18	8	10.04	20
Alajuela	3,117	.....	.....	4	15.75	21
San Isidro Alajuela	4,416	10.98	23	3	21.54	25
Puntarenas	.....	16.77	15	.....	.....	.....
Las Cañas	2,559	16.02	20	.....	.....	.....

Notes on earthquakes.—October 14, 10h 15m p. m., slight shock N.–S., duration 2 seconds, intensity I; also 11h 25m p. m., strong shock NW.–SE., duration 10 second, intensity IV. October 12 several slight shocks between 0 and 6h a. m. October 19, 7h 14m p. m. very sensible shock N.–S., duration 8 seconds, intensity III.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for October, 1904.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1904.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	25	19.38	14.01
Northern division	22	52	9.42	8.01
West-central division	26	26	19.41	12.83
Southern division	27	36	18.12	10.50
Means	100	139	16.58	11.34

The rainfall for October was, therefore, very much above the average for the whole island. The greatest rainfall, 44.28 inches occurred at Hill gardens, in the northeastern division, while, 5.07 inches fell at Negril Point Light House in the southern division.

Chart I. Tracks of Centers of High Areas. October, 1904.

Chart I. Tracks of Centers of High Areas. October, 1904.

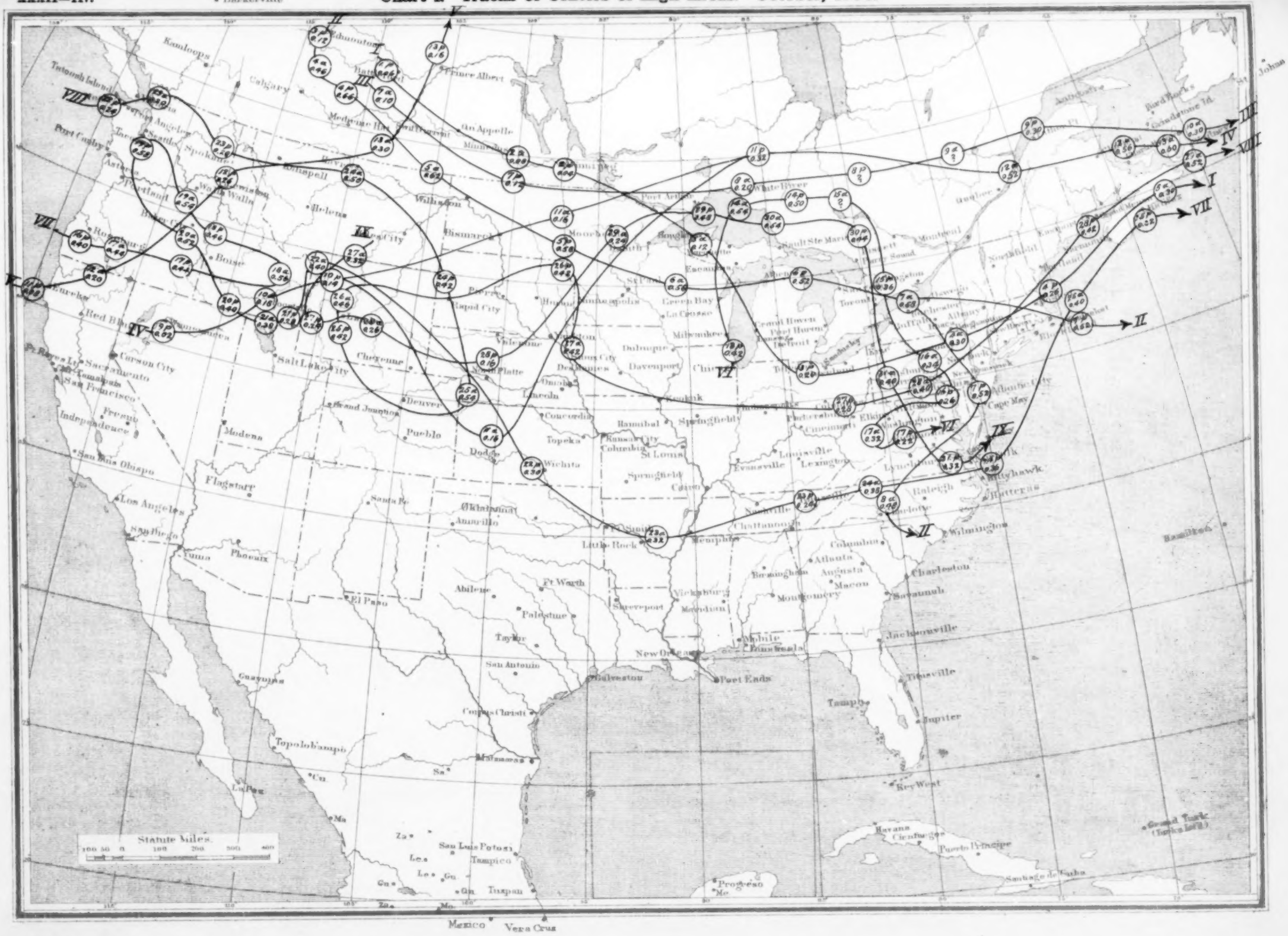

Chart II. Tracks of Centers of Low Areas. October, 1904.

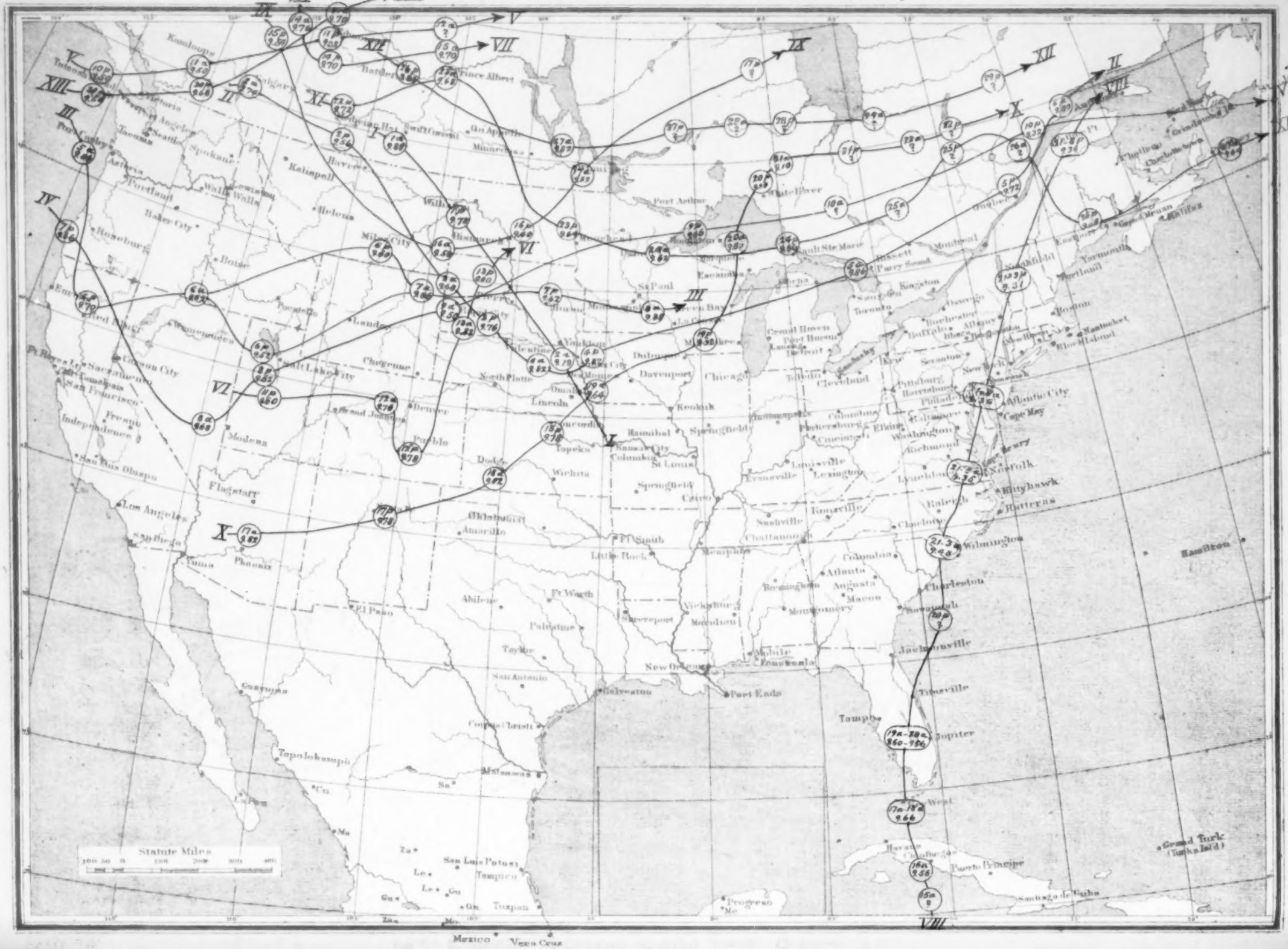

Chart III. Total Precipitation. October, 1904.

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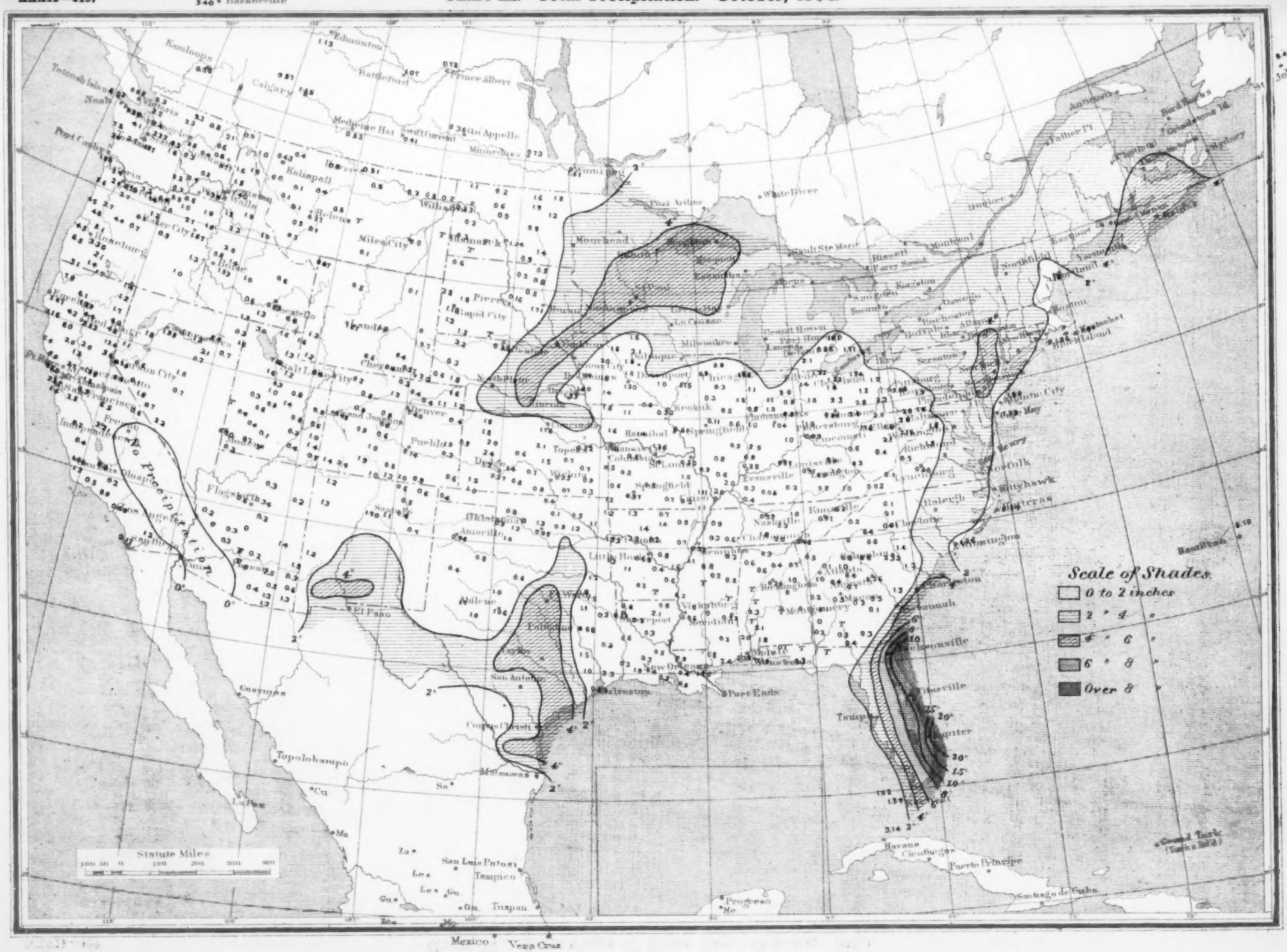

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Chart IV. Percentage of Clear Sky. October, 1904.

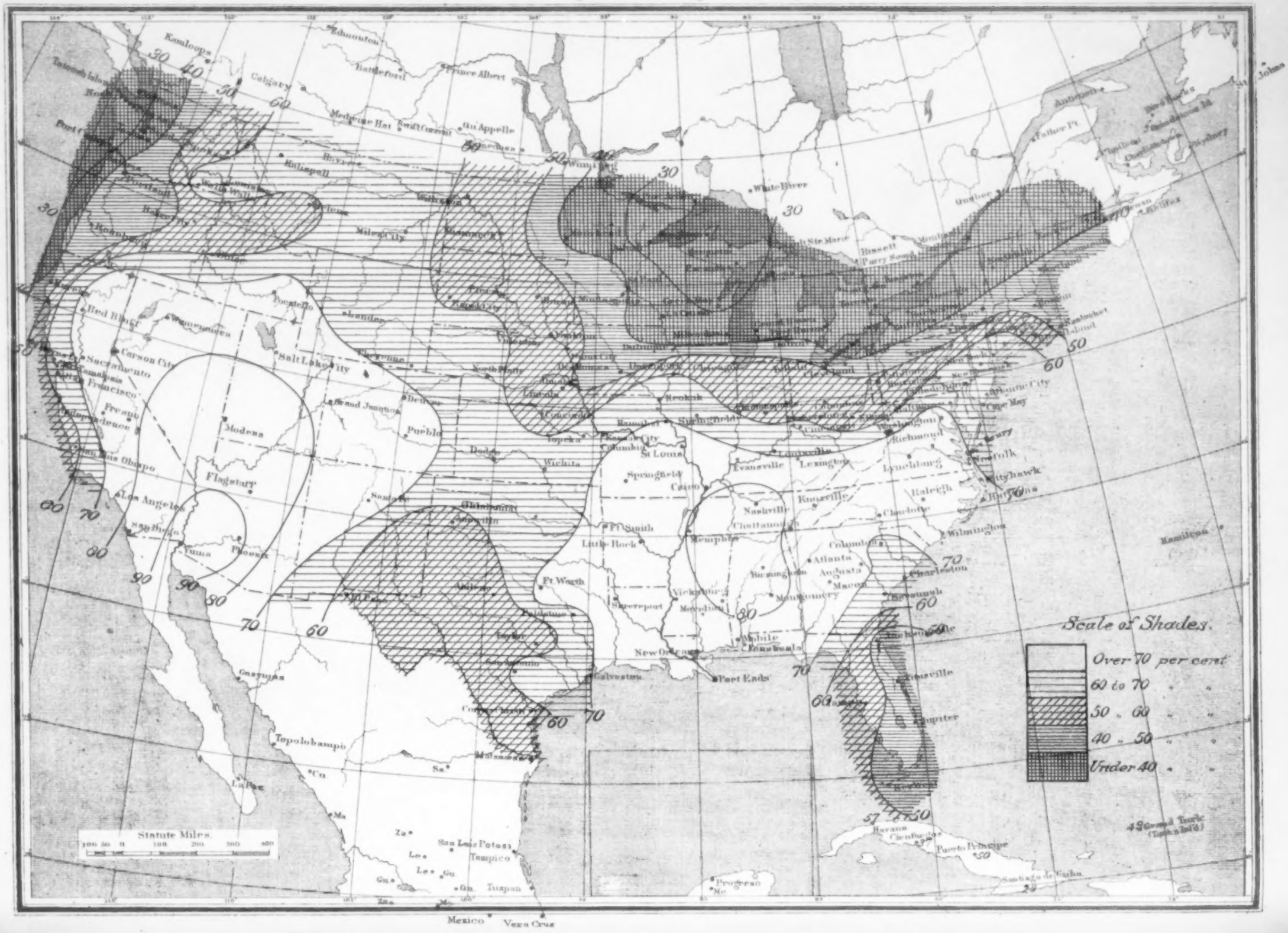

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Chart V. Surface Temperatures; Maximum, Minimum, and Mean. October, 1904.

Mexico Vera Cruz

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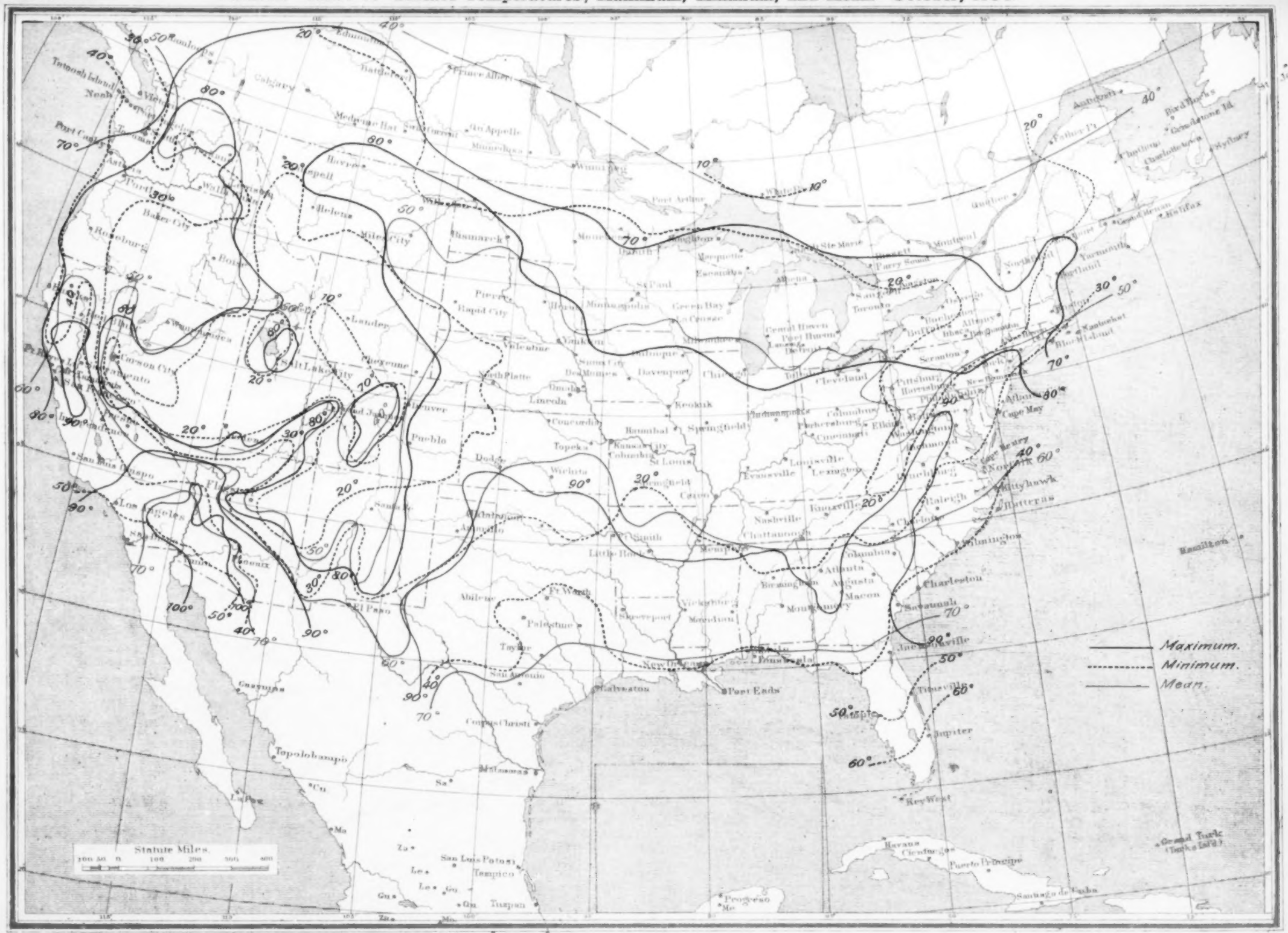

Chart VI. Isobars and Isotherms at 10,000 feet. October, 1904.

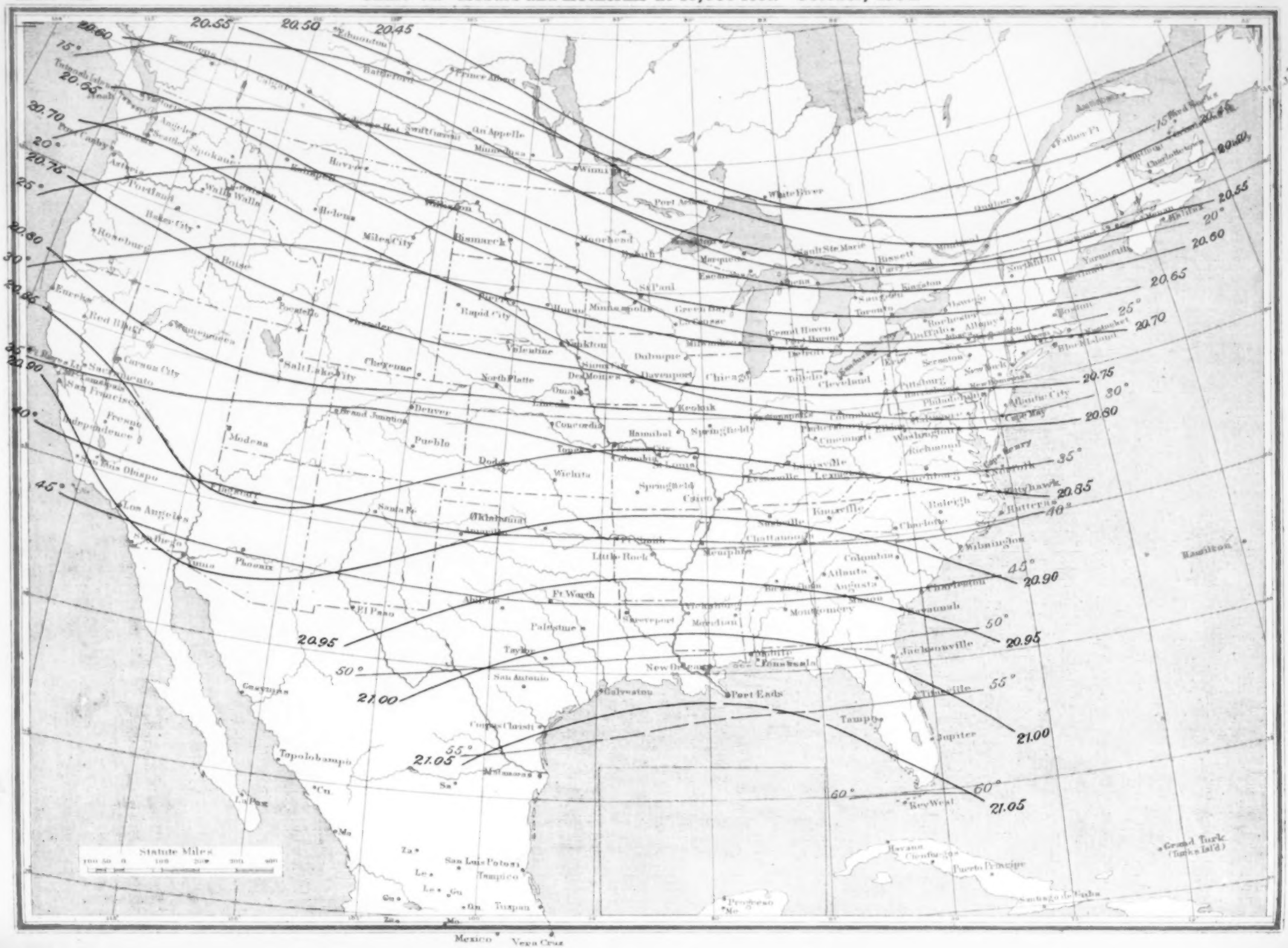

Chart VII. Isobars and Isotherms at 3500 feet. October, 1904.

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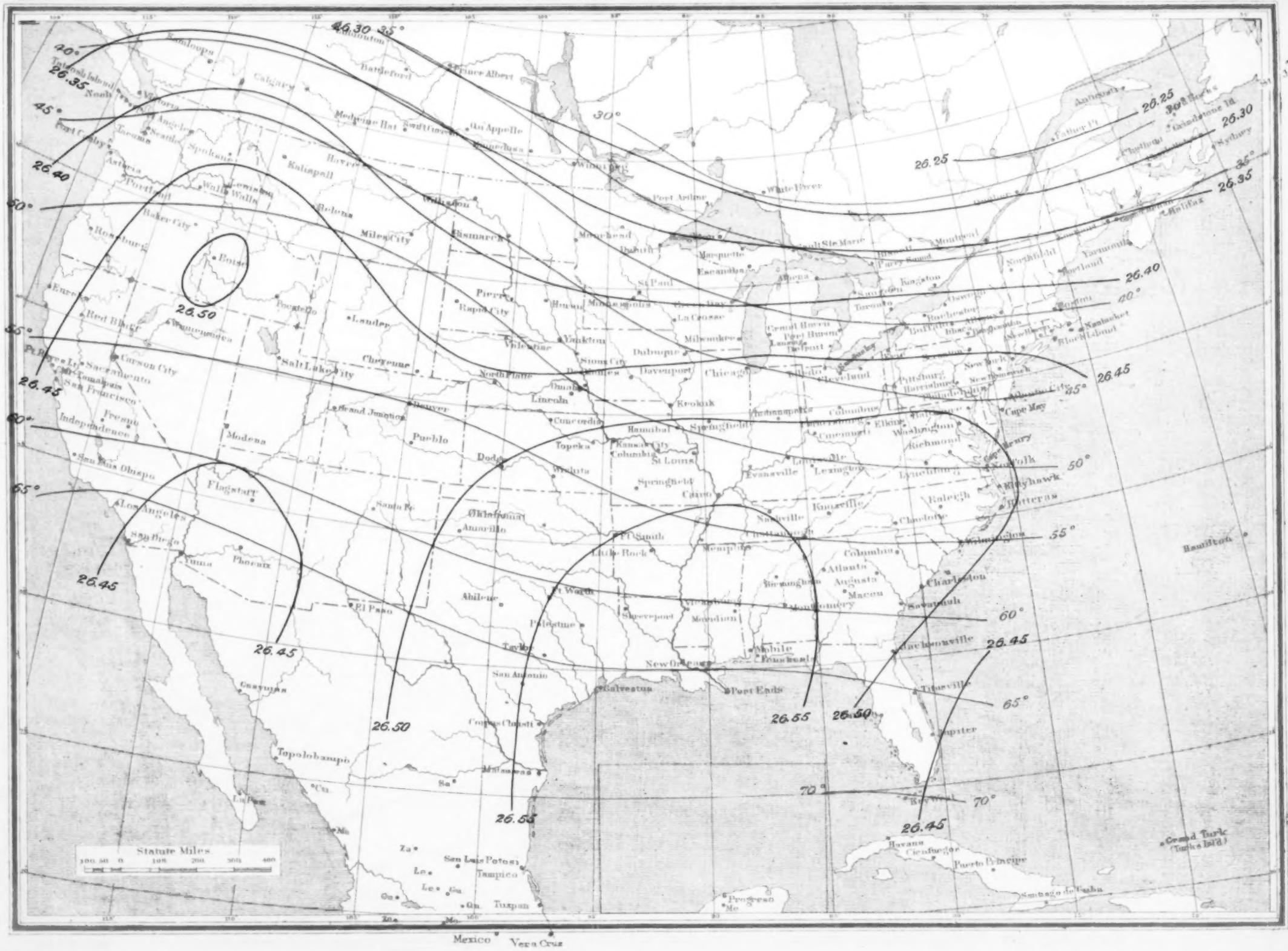

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Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds. October, 1904.

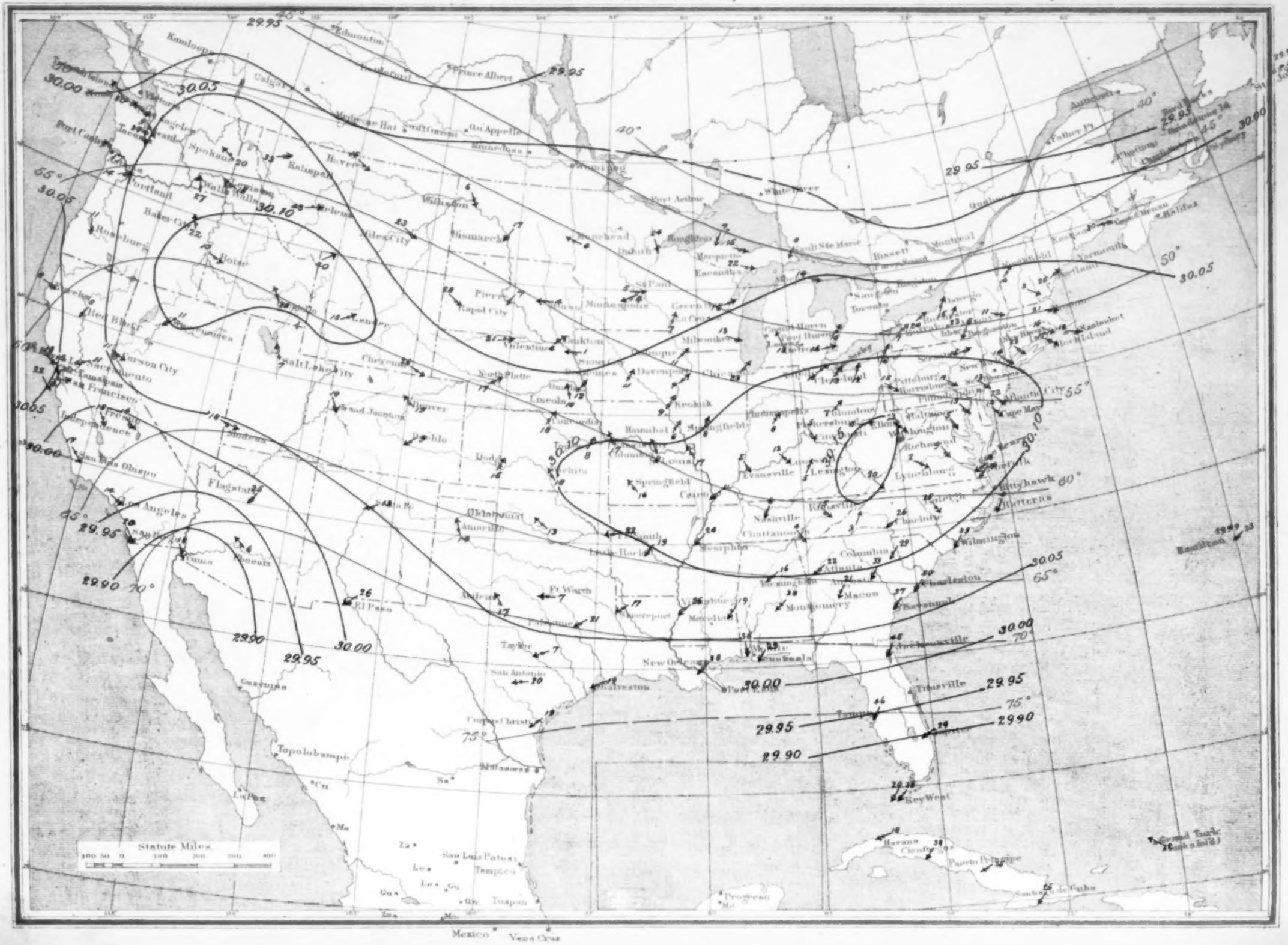

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. October, 1904.

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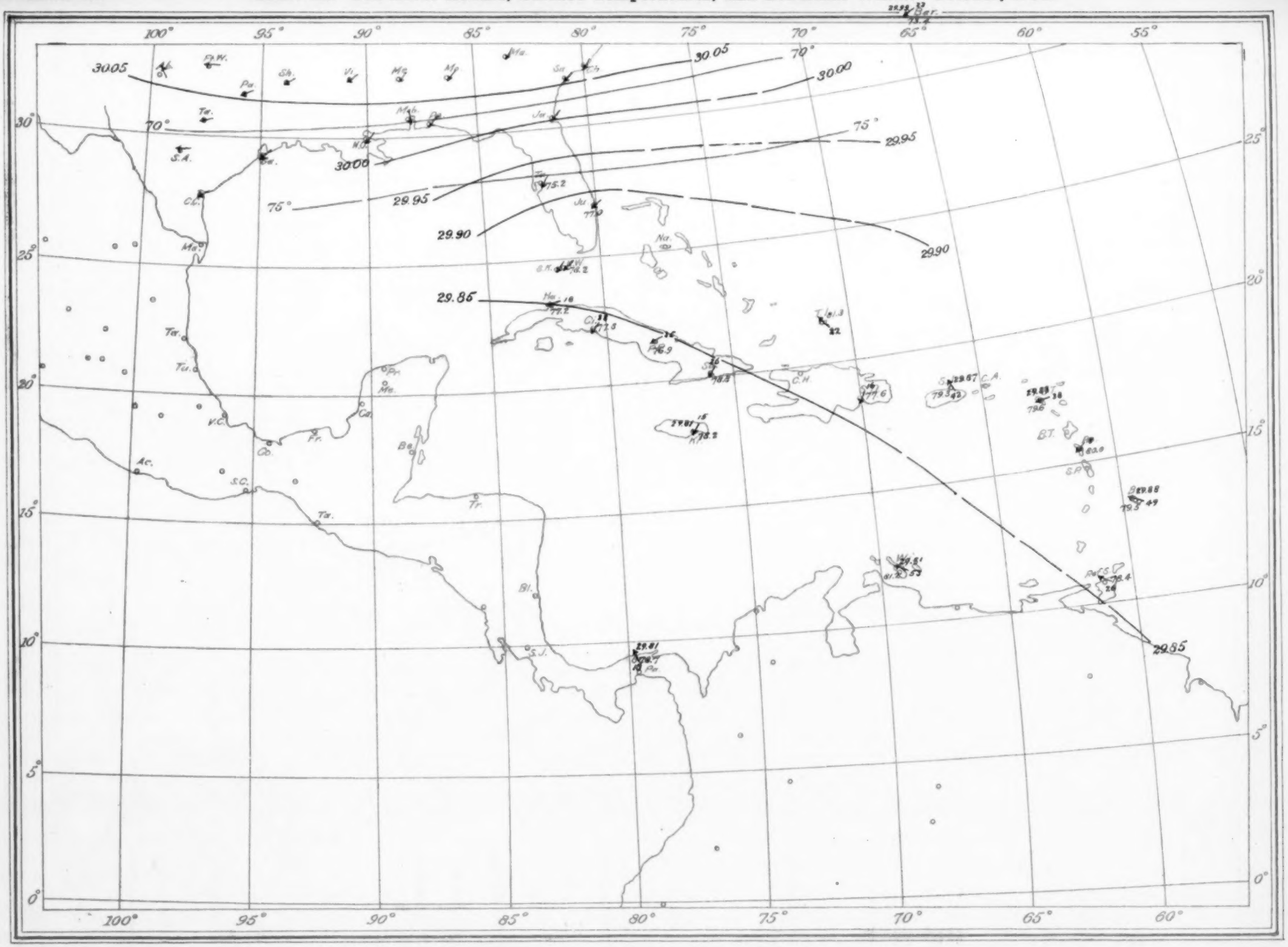

Chart X. Hydrographs for Seven Principal Rivers of the United States. October, 1904.

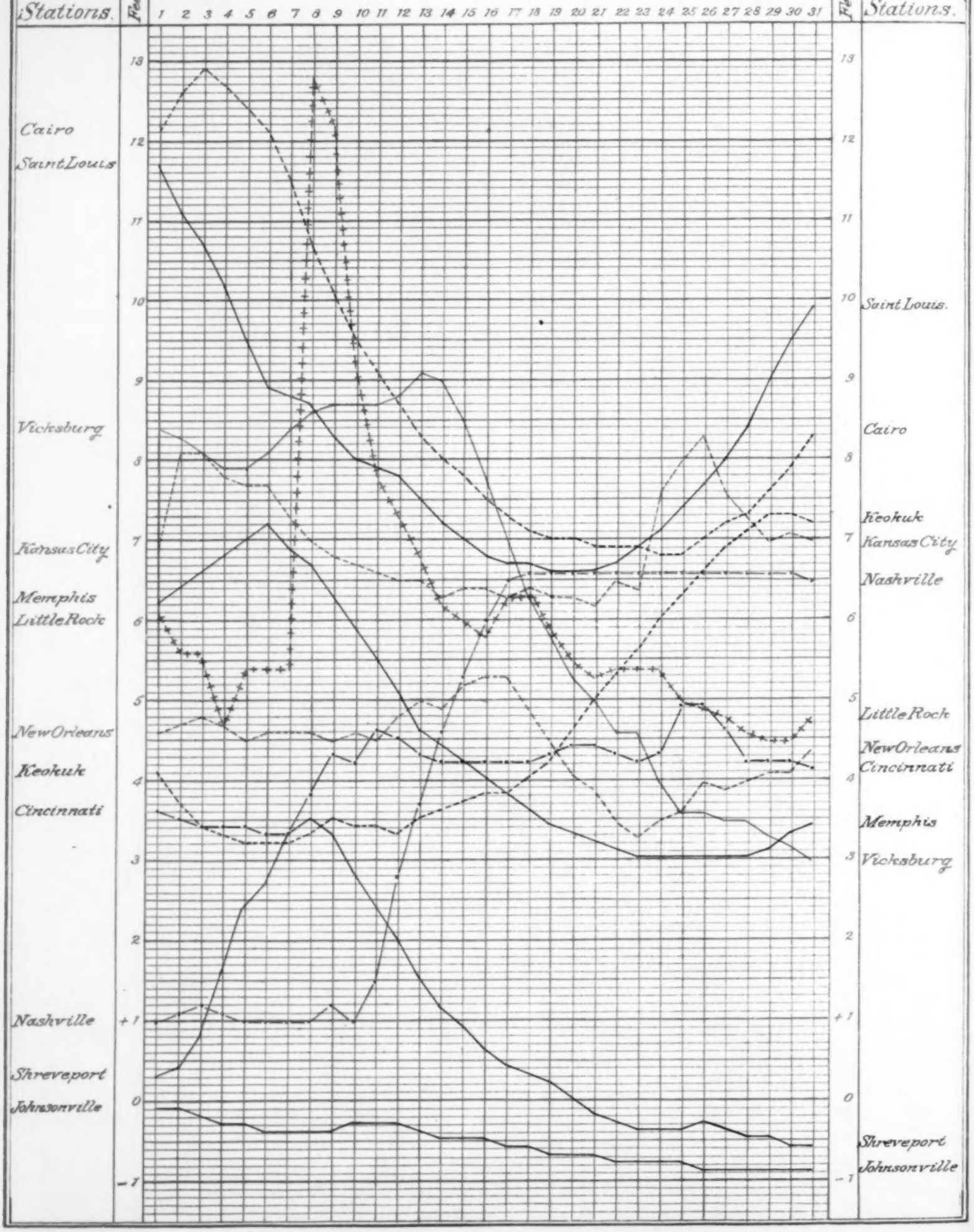

Chart XI. Total Snowfall for October, 1904.
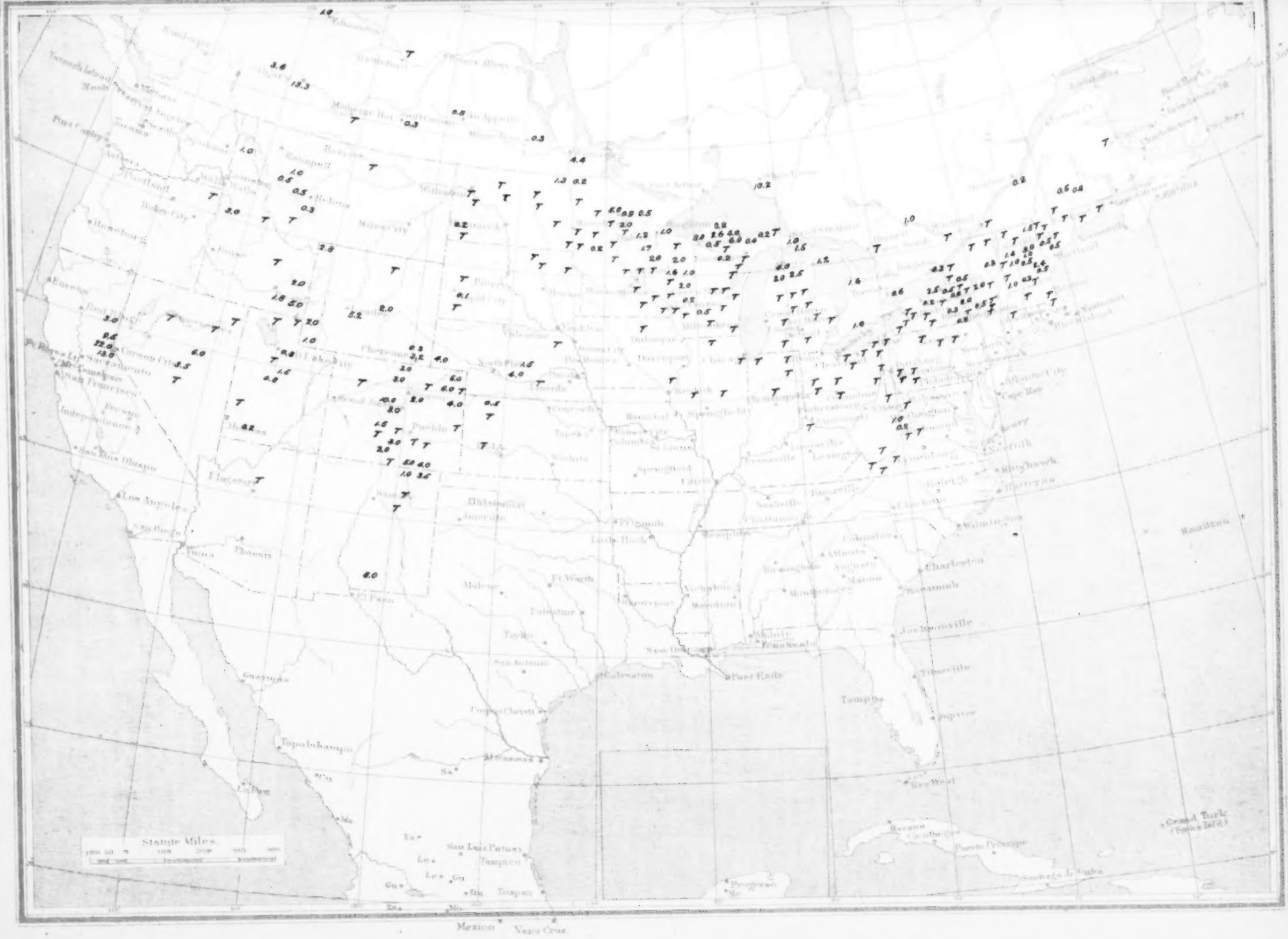
Chart XI. Total Snowfall for October, 1904.